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COLLEGE OF TROPICAL AGRICULTURE.

Peradeniya, April 15, 1913.

We publish to-day as a supplement the Report issued by the Committee appointed by the Board of Agriculture to bring before the public the claims of Ceylon as the site of the Imperial College of Tropical Agriculture. The Report has been sent to the Press of Ceylon, the members of the Ceylon Planters' Association, of the Low Country Products Association, of the Ceylon Agricultural Society (with this number); to certain London journals, the Universities and Learned Societies, the High Commissioners, India, the Dominions, the Crown Colonies and the United States of America; altogether some 6,000 copies. The whole Empire and the United States have thus been put in possession of the circumstances upon which the case of Ceylon has been based and we have received from several influential quarters gratifying assurances of support. We feel confident now that the facts have been set out that if there is to be an Imperial College it will be established in Ceylon.

This raises the point: is there to be an Imperial College—one great Imperial College of Tropical Agriculture to serve the whole Empire and indeed other countries too? The alternative is for each of the principal tropical countries to set up its own College; a poor alternative we think. But if there is to be an Imperial College supported by an Imperial grant the project should be laid before the British public and the scheme definitely outlined. This is a task the London Committee will no doubt take up. An Imperial College of Agriculture would be supported, we imagine, by an Imperial grant, subscribed to by the Dominions and the Colonies. This would take the form of an annual subsidy or of a foundation grant. In addition to the Imperial grant there should be a Ceylon Foundation Fund subscribed to by the people of Ceylon and also perhaps by the great Commercial Houses of London and the Steamship Companies interested in Ceylon welfare. Perhaps India would also join in subscribing to this fund as the Institution would certainly be of great benefit to her. Lastly, the College would no doubt also be provided for by a Government Vote.

It is time, we think, that subscription lists for the Ceylon Foundation Fund were opened and we suggest to the Press of Ceylon to consider whether this is not a task for them following the example of the great London Journals which never fail to open their columns for subscription lists when any great national project is forward. As pointed out in the last paragraph of the Report the starting of a fund would convey the impression that Ceylon was in earnest. People are generally more willing to believe in those who believe in themselves and have the courage of their opinions. There is no organization so well equipped as the Ceylon Press for reaching all classes.

THE REPORT OF THE COMMITTEE.

THE CASE FOR A COLLEGE.

In order that there may be no confusion it is necessary to state clearly that the question involved is not whether a College of Tropical Agriculture is needed for Ceylon. On this question opinion may be divided, some contending that the young men of Ceylon would not take advantage of a College of Agriculture; others, that Planters would still prefer to train superintendents under the "creeper" system. While we hold that neither of these contentions carry serious weight, and that Ceylon, like the Dominions of the Empire, who take the greatest pride in their splendid Colleges, would quickly come to realize the advantages—the necessity—of sound and scientific training in Agriculture as in other professions, we do not intend here to take up this side of the argument, though we may quote the late Dr. Treub of Buitenzorg, Java, who said that "the formation of an Agricultural Department to include a College of Agriculture would create a roll of great importance at Peradeniya of much use to agriculture in a Colony where agriculture is the chief source of Revenue. The necessity of establishing a University or College of Tropical Agriculture has practically been accepted in England, but the site of such an Imperial College being, we believe, still undetermined, it is our endeavour to set forth in this memorandum the claims of Ceylon as being the most suitable place for the College. In this connection it may be stated, however, that a member of this Committee recently received a letter from an influential quarter at home, asking for information as to what decision the people of Ceylon had come to about a College of Agriculture. It is time, then, for the voice of Ceylon to be heard on this matter.

THE PROPOSED UNIVERSITY.

The London *Times* in its issue of January 24th last pleads for a University of Tropical Agriculture being established in the West Indies. In our view, comprehensive as the teaching should be, the subject does not specially demand an University. An University is generally understood to be an institution comprising many faculties, such as Arts, Law, Commerce, Medicine, Engineering; the needs of Tropical Agriculture could be met by a faculty of Tropical Agriculture in a University or by a College.

Nature follows the *Times* in favouring the West Indies as the place for a University or Imperial College, chiefly on the grounds of their being of easy access to the British Isles, affording professors and lecturers the opportunity of frequent personal intercourse with fellow-workers at home. In our judgment this is to misapprehend the character of tropical work. Tropical Agriculture can only be studied in the tropics, and those who come out and join its ranks are compelled to leave behind very much of what they have learnt at home.

In this respect tropical agriculture is on a somewhat different footing from medicine, engineering, law, commerce.

If, to quote *Nature*, the College should in the first place "be situated in a Colony offering the greatest possible scope for diverse agricultural pursuits," and, secondly, "the healthiness of the Colony should, as far as possible, be beyond reproach," then we contend there is no Colony in the Empire that can challenge the claims of Ceylon.

CEYLON ON THE OCEAN HIGHWAY.

Ceylon, situated in the very heart of our Tropical Empire, is on the Ocean Highway to the East Indies and to Australia, in close proximity to India, Assam and Burma, in touch with Mauritius and the Seychelles as well as with East Africa where great tropical planting industries, growing in dimensions yearly, are arising. Both British East Africa and Portuguese East Africa look to Ceylon, and have done for many years, for advice and assistance in matters concerning tropical agriculture; and this to a considerable extent is also the case with Australia. Ceylon trained planters are to be found in large numbers in Malaya, the Straits Settlements, Assam, Southern India, and many of the Islands of Oceania, thus linking the Island with the tropical and sub-tropical world. It is manifest, assuming that an Imperial College of Agriculture is to be established, that the most convenient centre in the East is this Island.

THE TROPICAL PLANTING INDUSTRIES OF CEYLON.

In an issue such as that under consideration, the interests of the student should govern the choice. We should not press the claims of Ceylon did we not feel that the interest of students could nowhere else be served as they would be here, because there is no other country in the world, as far as we are aware, wherein so many planting industries can be seen thriving under prosperous commercial conditions and within so small an area. Within a radius of 75 miles of Peradeniya and at elevations ranging from sea-level to 6,800 feet there exist plantations of coconuts, tea, rubber, cocoa, cinnamon, citronella, tobacco, tropical fruits, spices and vegetable products, thriving, industries of desiccated coconuts, and coconut fibre and the manufacture of coconut oil. Sisal hemp and cotton are being taken up by the Department of Agriculture. Ours is essentially an Agricultural Colony having under cultivation nearly a million acres of coconuts, over half a million acres of tea, 186,000 acres of rubber, 47,000 acres of cinnamon, 43,000 acres of cocoa and 800,000 acres of other tropical products, such as rice, citronella, tobacco, camphor, cardamoms, arecanuts, bananas, pineapples, sugarcane, cassava and fibres, etc. It has a large dry zone where tropical agriculture under irrigation is carried on.

In the high elevations sub-tropical products such as maize, wattle lucerne will thrive, while the climate in certain localities is not unlikely to prove suitable for ostrich farming, the Angora goat, sheep and cattle breedings.

The resources of Ceylon, from an educational point of view, are we believe, unrivalled; so much so that the obligation does not so much lie with us to proclaim them as with other countries to show they have better.

PERADENIYA.

A recent writer, fully qualified to express an opinion, stated that he thought it paid a botanist or an agriculturist better to spend a month, or even two, at Peradeniya and collect information and plants than to go round the whole tropical world for the same purpose. Professor Francis Ramaly wrote "as a *Show place* these gardens are not equalled anywhere in the world, and as a place of scientific interest to botanists there are few rivals."

Hæckel, the German zoologist and philosopher, said of his visit to Peradeniya that in the four days which he spent there he learned more botany than he could have learned at home in as many months of hard study.

Sir W.T. Thiselton Dyer called Peradeniya the "Kew of the East."

The Peradeniya Gardens are nearly one hundred years old and cover an area of 150 acres. They contain almost every economic product of importance known to the tropical world. The gardens with their trained staff of Gardeners would provide for the Horticultural side of the College course. The Library contains some 6,000 volumes, and exchanges with or purchases all the important current agricultural and botanical publications. The Herbarium has 22,000 floral specimens; the Museum 350 specimens of timber and 2,400 of economic products; the entomological laboratory some 3,000 specimens; the mycological laboratory 4,000 specimens. Across the river a site of 40 acres has been reserved on the Experiment Station for College Buildings. On this station, which covers 500 acres,—cocoa, tea, rubber and coconuts are grown on plantation scale, while experiments are conducted on a smaller scale with a variety of other products.

Peradeniya is the headquarters of the Department of Agriculture with its staff of specialists. When in full working order the Department will have eleven or twelve Experiment Stations and Botanic Gardens distributed over the Island; besides over 250 school gardens under its control, available in some cases as trial grounds.

These Experiment Stations are, or will be conveniently situated near the railway, and will be accessible from Peradeniya by road or rail in one day.

To these attractions must be added that of climate. Peradeniya is at an elevation of between 1,600 and 1,700 feet with a mean temperature of 75°F. The nights are always cool, and even in the hottest months the days are not too oppressive for study.

One of the stations, (Hakgala,) to become a centre of sub-tropical development is at an elevation of 5,000 ft.

From the foregoing it will be obvious that the College would necessarily be situated at Peradeniya, already a centre of study, research and instruction. When the University of Ceylon comes to be established, as presumably it will in the course of time, the Peradeniya College would become one of the Colleges of the University, which would then grant degress in Agriculture. There would perhaps be three classes of students: those who had already gone through a scientific course of training in agriculture and wished to specialise in Tropical Agriculture; for this class a year at Peradeniya would be sufficient. A second class would comprise those who had taken a science course at school, and for these two years would be required. For those who had received no scientific training, three years would be necessary.

This Scheme of a College of Tropical Agriculture is quite independent of the teaching of agriculture in village schools, preparation for which is already being made. School instruction of the goiya will go forward whatever happens to the College, but no doubt the two would come under one control, as there would be a certain amount of overlapping.

CONCLUSION.

The case for Ceylon as the site for an Imperial College of Agriculture is seen to be a strong one, but it would be greatly strengthened if the people of Ceylon showed their imperial spirit by raising a fund to go towards its endowment, and we urge this aspect of the question upon the public. The raising of a fund would be an earnest that the people of Ceylon believed in the splendid opportunities for agricultural education possessed by their island. With these possibilities it would indeed be disappointing if the College were to go to some other country less favoured, yet there might be a possibility of this if the case of Ceylon were not sufficiently backed. We are but at the beginning of Tropical Agricultural development in the East; with the enormous labour resources of India and China to draw upon, no limit can be set to its expansion. The young men of Ceylon will take part in this expansion not only in their own country but, equipped as they would be at a College, in other eastern countries also, for nothing would be so likely to overcome the prejudice against agriculture now felt among Ceylonese as a College that would elevate it into a profession. We therefore recommend that subscription lists should be opened for the raising of a fund to go towards the endowment of the College.

Leading men in Ceylon could found chairs or appoint that their donations be devoted to some specific purpose, in order that their names should become associated with the foundation.

Signed on behalf of the Committee,

C. DRIEBERG,

Hon. Secretary.

THE COMMITTEE.

The Hon'ble Mr. P. Arunachalam, M.A., C.C.S., Member of the Executive Council.

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W. A. de Silva, j.p., f.r.c.i.

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The following gentlemen have been invited to serve on the London Committee :—

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Sir Henry A. Blake, g.c.m.g., f.r.g.s., late Governor of Ceylon; Deputy-Lieutenant of Ireland.

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The Chairman, Ceylon Association in London, 62, Gracechurch Street, London, E.C.

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RUBBER.

COMMERCIAL POSSIBILITIES OF SYNTHETIC RUBBER.

By LOTHAIR E. WEBER, Ph.D.

It is rather peculiar that although the conversion of isoprene into a rubber-like substance has been known for upwards of twenty years, further progress in this direction has been practically stagnant until recent date. This is not altogether due to lack of effort, but rather to the enormity of the problem. The synthesis of rubber, however, received a new impetus about three years ago when two German chemists, Hofmann and Harries, working independently, succeeded in obtaining almost simultaneously products which gave the chemical reactions of rubber and had certain physical resemblances to the natural product. Since then, considerable progress has been made in this direction and, more recently, stock companies have been formed and capital subscribed with a view to actually placing synthetic rubber on the market. The daily press, both in this country and especially in Europe, gave this latest development of synthetic rubber wide publicity, sharing the optimism of the promoters and inventors of the new process, and as a result, the general public and, to a very large extent, rubber manufacturers themselves, have been led to believe that synthetic rubber can in the near future be manufactured in competition with the natural product.

I do not want to give the impression of holding in light regard the magnificent work which has been accomplished by European chemists in their efforts to synthesize rubber. I almost think that a certain amount of chemical training is necessary to appreciate the innumerable difficulties and pitfalls which face the investigator in these fields. These men deserve the profoundest admiration for their painstaking and laborious efforts, but it is greatly to be deplored that the public was given to understand that synthetic rubber is to-day a commercial possibility, since, if the promise is not fulfilled, the attitude of the public will scarcely be one of admiration.

Synthetic rubber enthusiasts have been very fond of comparing the synthesis of rubber with the synthesis of indigo, asserting that the same fate awaits natural rubber that befell natural indigo. These two problems, however, have very little in common and differ from each other in such striking respects that the two syntheses are not capable of comparison. I should like to take up this comparison in more detail because I think in this way the difficulties which will prevent commercial synthetic rubber becoming a realization during the next few decades can be more clearly shown. Before doing so, however, I would ask your indulgence in attempting to make clear to those of you who are not chemists, the meaning of a rather formidable looking word which is always in evidence whenever there is any mention of synthetic rubber. I refer to the word "polymerization."

We are being continually informed that isoprene polymerizes to rubber and that the process of converting isoprene into rubber is one of polymerization. The process of polymerization, briefly stated, is one whereby a large number of small units combine to make a single large unit. It is essentially a process of agglomeration. This process of agglomeration takes place between the molecules, the latter, as you know, being regarded as the smallest amount of substance that is capable of existence. The molecules of isoprene, at least 100 of them, unite and polymerize into one single molecule of rubber. Unfortunately, we have not the least idea exactly how many isoprene molecules go to make one molecule of rubber, and it is probably certain that the natural rubbers themselves vary very widely in respect of their degree of polymerization. It does, however, seem probable that the higher the degree of polymerization; that is to say, the more the number of isoprene molecules that unite to form one rubber molecule, the better are the physical properties of the rubber. In other words, two rubbers of exactly the same chemical composition, with different physical properties, owe this latter difference to their different degrees of polymerization. It follows then, that a uniform degree of polymerization would be the first requirement for a synthetic rubber.

Unfortunately, the chemist of to-day is absolutely powerless in determining this degree of polymerization experimentally and, to a certain extent, of controlling it. For instance, it is not possible to go into a laboratory with a quantity of isoprene and polymerize the latter to any desired extent. In fact, we have no means of feeling sure that we can on two different occasions bring about the same degree of polymerization. With the chemical methods available to-day it would be absolutely impossible to make a product with an assured uniform degree of polymerization, and until this is possible, I fail to see how there can be any possibility of commercial synthetic rubber. The first requirement of such a product is uniformity of polymerization, but as we have no means of determining this uniformity, or lack of it, variations would be bound to occur which would make the employment of such synthetic rubber by the manufacturer altogether too precarious. We all know to what disagreeable results variations in the uniformity of the natural product lead and in the latter case the possibilities for uniformity are infinitely more favourable than in the case of the synthetic product.

Now let us briefly consider the case of indigo. Here the problem was to manufacture an article of absolutely definite characteristics and properties. It undoubtedly required a vast amount of chemical skill before the composition of indigo was determined, but once this important feat having been accomplished, the chemist had a definite conception of the substance to be synthesized. Furthermore, there could never be the least doubt as to whether the investigator had actually succeeded or not in obtaining indigo. It is the work of only a few moments to be able to definitely decide whether a product is indigo or not.

In the case of rubber, the state of affairs, as we have seen it, is totally different. In the first place, the methods of polymerization are still in their infancy; we have no means of controlling its magnitude, or of assuring its uniformity. The chemical methods of to-day are wholly insufficient for the solving of this problem.

Synthetic rubber enthusiasts have either overlooked or ignored with supreme indifference the very important fact that in the year 1916 the price of raw rubber must of necessity drop very considerably. It is estimated (and from all accounts the estimate is a conservative one) that by the year 1916 the Eastern plantations alone will be able to produce 100,000 tons per year, although there are two factors which have not been taken into account in making the estimate, which might have a very serious effect on the future of the plantations. These two factors are: first, diseases of the trees, and secondly, the labour problem.

The chance of the trees becoming infected either with a disease or insect pest is probably very small, as the bulk of the plantations are under very careful supervision, and special precautions are being taken to prevent such an occurrence. The labour question seems to be of more serious consequence, as the Malay cooly is of a rather independent nature. Nevertheless, it is highly probable that the estimate is not exaggerated. Even to-day one repeatedly hears statements being made that the plantations that are producing rubber could, if necessary, put their product on the London market at 25 cents per pound. This is possibly slightly exaggerated, but not very much so. One has only to look at the dividends now being paid by some of the Eastern plantations to realize that there is a certain amount of truth in this statement. As things stand to-day, supposing it were possible to market synthetic rubber at 50 cents a pound in great quantities, the competition with plantation rubbers would not be very noticeable, as their output is relatively small; but in 1916 the case will be quite different. Even supposing that the demand for rubber keeps on increasing, the plantations will still be in a position to supply at least half of the demand. There are, furthermore, enormous opportunities for the plant physiologist in the cultivation and production of rubber. So far very little has been done in this direction, as the plantation industry is still in its infancy; but it seems more than probable that careful experimentation will enable means to be devised whereby the yield of rubber per tree can be materially increased.

In the case of the sugar beet this increase in the yield has been accomplished with surprising success. It has been possible by careful methods of cultivation and selection of the most advantageous conditions of soil, to raise the yield of sugar in the beet from 3 to 18 per cent. Undoubtedly, in the case of rubber, the problem is more complex than in the case of the sugar beet, but this field of investigation is still waiting for the pioneer, and I cannot help feeling that the possibilities are indeed large.

It must be seen, even on the supposition that synthetic rubber were to-day a commercial possibility, and that an article could be produced equal to the plantation product, that the struggle for commercial supremacy would necessarily be a fierce one, with the advantage very much in favour of the plantation product.

In the case of indigo, the synthetic product had practically no competition to meet whatsoever. The production of natural indigo had been carried out under the crudest possible fashion, and the methods of obtaining the dye from the plant were even more crude. For some extraordinary reason, although the production of this dye stuff was of such extreme value to the textile industry, it always remained in the hands of the ignorant natives. Had the same amount of energy and skill been applied to the indigo plant that is now being applied to plantation rubber, the victory of synthetic indigo would probably still be in doubt. It must be granted that the commercial synthesis of indigo was the crowning technical achievement of the nineteenth century, but it must also be acknowledged that its fight for supremacy over the natural product was materially aided by the shortsightedness of indigo planters. Rubber planters, on the other hand, have been keenly alive to the large possibilities which are to be derived from scientific methods of cultivation and production, and they have got such an infinite lead over the efforts of the synthetic chemist, as to be in little danger of being vanquished for many decades to come.

I hope I have not been altogether unsuccessful in making plain some of the difficulties that confront commercial synthetic rubber. With our present day chemical methods it would be well nigh impossible to assure a uniform synthetic product. Within the next few years the Eastern plantations will be in a position to supply half the demand for rubber, and accordingly would be in a position to wage a very stubborn fight against any synthetic product. Finally, it seems more than probable that scientific investigations will enable the planter to increase the yield of rubber per tree, and thus put him in a still better position to combat the synthetic article.

I do not want to make such a rash statement as to assert that synthetic rubber will never be a commercial possibility, but I should be greatly surprised if there is anybody engaged in the rubber industry to-day who will have the opportunity of seeing synthetic rubber in open competition with the natural product.—*The India Rubber World.*

FINE HARD CURE RUBBER.

SAMPLES OF RUBBER CURED BY THE WICKHAM AUTOMATIC APPARATUS. (B. Model.)

The Editor of The "Tropical Agriculturist."

Dear Sir,

The samples of rubber prepared in this process are offered for inspection as equivalent to "fine hard" Brazilian Para Rubber,

The rubber is prepared from pure whole latex without the use of a coagulant, other than the application of smoke and heat.

The principle of curing is the same as in the case of the Amazon product, but the Wickham apparatus offers a more efficient means than the primitive utensils of the Amazon for the preparation of "fine hard cured" rubber.

All the latex as obtained from the tree enters into the rubber without residual excepting a small quantity of moisture.

The percentage of moisture contained in the sample is in the neighbourhood of *10*, probably less than more.

It will be seen that the rubber consists in a series of superimposed laminæ or films, each of which is superimposed upon its neighbour during the process, and each film or lamination is individually treated and cured by the smoke impingement, 200 degrees.

The latex on an organized estate can be made quite easily into large consistent quantities—thus securing uniformity—similar to sample, at a considerably reduced cost of production.

It will be observed that in making this rubber—as in the case of "Hard cure Para"—the latex is not coagulated, but is set in superimposed films or laminæ, the latex forming an amalgam with the essential oils obtained of a certain class of smoke, thereby constituting the antiseptic cure. Hard cure Para is never dried.

The present samples have been rather roughly blocked, but may be set much closer by a correctly arranged press and so a better appearance imparted to the rubber.

The Makers in Ceylon are:

Colombo Commercial Co., Ltd.,

Colombo.

For

David Bridge & Co., Ltd., Castleton Iron Works, Manchester, England.

Yours faithfully,

H. A. WICKHAM.

COAGULATION OF FUNTUMIA LATEX AT PERADENIYA.

The latex was gathered by means of vertical cuts, 2 inches apart and 6 feet in length all round the tree. The latex was collected by means of a clay collar at the foot of the tree leading into a cup.

Water was boiled and acetic acid added in the proportion of 100 c.c. of acid to 6,000 c.c. water. Into this the latex was gradually poured and kept stirred. Two pounds of latex took one hour and twenty minutes to coagulate.

D.S.C.

TOBACCO.

THE WORLD'S CROP.

We take the following table from the Editorial of the *Indian Trade Journal* of February 20, 1913, which shows the leading producing countries and the quantities produced in each during 1910:—

	Lbs.		Lbs.
United States ...	1,103,415,000	Argentina ...	31,000,000
India ...	450,000,000	Algeria ...	20,723,000
Russia	200,773,000	Belgium ...	19,474,000
Austria-Hungary ...	184,817,000	Canada ...	16,513,000
Dutch East Indies ...	128,660,000	Greece ...	15,840,000
Japan	91,850,000	Italy ...	15,552,000
Brazil	75,285,000	Roumania ...	15,434,000
Germany	63,611,000	Bulgaria ...	13,944,000
Turkey-in-Europe ...	49.177,000	South Africa ..	13,519,000
Cuba	46,081,000	Paraguay ...	13,000,000
Santo Domingo ...	42,000,000	Porto Rico ...	10,000,000
Philippines ...	40,258,000	All others ...	23,913,000
France	36,446,000	...	
Mexico	34,711,000		
		TOTAL.	2,756,000,000

POULTRY.

EXPERIMENTAL WORK IN ARTIFICIAL INCUBATION.

By W. BROWN,
West of Scotland Agricultural College.

All practical poultry-keepers will probably agree that the results obtained by artificial incubation are not equal to those obtained by natural means. This fact is demonstrated in two ways, namely, by the lower hatching percentage with incubators, and the higher vitality of the chickens hatched under a hen. Very little is known at the present time about the subject of artificial incubation, and it is strange, in view of the importance of the question, that so little work is being done to solve the many and complex problems that are encountered when operating incubators. For industrial poultry-keeping the whole question is of paramount importance. Once determine the conditions that are essential to the successful hatching of a large percentage of strong chickens and the whole industry will be benefited to a degree which it is difficult to over-estimate.

During the past twenty years valuable discoveries have been made in other branches of the industry, but few important improvements have been introduced in relation to incubators.

So far as is known at present there are three factors essential to success in artificial hatching, namely, temperature, ventilation and the humidity of the atmosphere surrounding the eggs. The maintenance of an even temperature presents the least difficulty for the majority of machines can be worked for weeks with only a very slight variation. It is, therefore more important to consider the problems connected with ventilation and the humidity of the air in the egg chamber.

It has always been contended that pure air is necessary to the growing embryo within the shell.

During the past ten years Mr. R. J. Terry, poultry expert to the Tasmanian Government, has been carrying out experiments to test the truth of this assumption, and recently he has published the results of his work. His investigations are not by any means conclusive, but they serve to indicate the line of thought he is following. Professor W. R. Graham, of the Ontario Agricultural College, Guelph, has also been conducting similar experiments; they are not as yet sufficiently advanced to render publication advisable.

The contention of Mr. Terry is that both manufacturers and operators of incubators "have the mistaken idea that they are developing something which, in the embryonic state, breathes by means of lungs. If that were the case they would be quite right in their oft-repeated statement that, like a man, a chick cannot breathe too much pure air." But anyone who has given thought to the subject understands that the blood of the embryo is purified not in the

lungs, but in the allantois, the respiratory sac, a membranous sheet of blood-vessels spread out beneath the shell, while the lungs are only brought into use just before the bird is hatched.

Mr Terry was first led to investigate along his present lines after noticing the effect of free air on the blood-vessels of the embryo. He was studying the embryo with a part of the shell removed, the greater part of the egg being submerged in warm water. The removal of part of the shell had no injurious effect, but after a short exposure to the air the blood-vessels were ruptured. It was this observation that first of all suggested that eggs receive too much air in modern incubators. All operators know that in testing eggs there are a number showing an irregular broken ring of blood, instead of the "spider" seen with a living embryo. To throw further light on the subject a number of eggs were placed in different incubators of the same make which were worked under similar conditions except as regards ventilation. More ventilation was allowed to some of the machines than to others. The result was, in Mr. Terry's own words, that "those incubators which had an excess of ventilation gave the poorest results, both as regards the ruptured system occurring some time before the sixth day, as also to a large number of dead in the shell."

We have frequently noticed this blood ring on testing for fertility on the sixth day, but whether it is formed after the death of the embryo, or is the cause of death, is a question for the embryologist to answer.

In support of his theory Mr. Terry advances one important argument which is supported by other investigators, namely, that in natural hatching there is a large amount of carbon dioxide in the air surrounding the eggs. This has been shown not only by Mr. Terry, but earlier by Professor W. H. Day, of Guelph, Professor J. Dryden of the Utah Station, and Mr. J. L. Nix, Homer City, Pa. The quantity is frequently known to be three times greater than that in incubators. Even when hens have been tested when sitting on dummy eggs in an India-rubber nest, the amount of carbon dioxide in the air has been found to be considerably greater than in a well-ventilated machine. This appears to indicate that the carbon dioxide is given off by the hen's body, and is not the accumulation of gas given off by the eggs. This is the most important fact that has been brought forward in favour of the theory that carbon dioxide is beneficial to the developing embryo.

The Sydney *Daily Telegraph* gave prominence to the theory advanced of Mr. Terry, and to assist in the investigation they instructed Mr. S. Ellis, by Botany, New South Wales, to conduct a series of experiments, which would, to some extent, check the conclusions. Mr. Ellis was somewhat opposed to the idea, but carried out two experiments. The two tests were so closely alike that it will be sufficient to quote the last one as extracted from the journal named:—

"The second incubation test conducted by Mr. S. Ellis, of Botany, New South Wales, confirms the results of the first experiment. His eight Zenith machines were run on exactly the same lines as in the first test as regards ventilation and moisture, and the eggs were from the same pen of White Leghorns. In this instance a variation was made in regard to the system of

turning the eggs in the incubators. There was a striking similarity between the results of the respective machines in the two hatches, and again the highest percentage and the best chickens were produced with no ventilation for the first fourteen days. The general average of living chickens from the eight hatches was 68·4 per cent., as compared with 71·4 per cent. in the first test. Of course, in considering these averages, it has to be borne in mind that some of the incubators were run for experimental purposes under conditions that were not expected to give first-class results.—*The Journal of the Board of Agriculture.*

CHICKEN REARING ON AN INTENSIVE SYSTEM.

In connection with the system of intensive chicken rearing adopted by Mr. F. G. Paynter, and described in this Journal for December, 1912, page 721, it may be pointed out that the system described must still be regarded as in the experimental stage. It is most undesirable that those who have not already a thorough practical acquaintance with the management of poultry should attempt to adopt such a system, as it demands much more knowledge, skill, industry, and care than are necessary where poultry-keeping is conducted under ordinary conditions.

A general description of the equipment used in Mr. Paynter's experiment, and of the methods adopted by him, will be found in the article referred to above; but attention may be drawn to the fact that, in addition to the possession of adequate capital, and a suitable area of land in proximity to a market, a thorough practical knowledge of the best methods of artificial incubation and rearing is indispensable for anyone who proposes to attempt to carry out the system on the scale described in the article.

Those who have not the necessary knowledge are recommended either not to attempt such an experiment or to begin operations in a purely tentative way, with a view of gaining practical experience of the proper methods, and of testing their own qualifications for such an enterprise.

Success in dealing with all classes of livestock depends on certain aptitudes in the individual which are not possessed by all, and also a practical experience which can only be gained in the course of time. In addition, it must be remembered that, in all such undertakings, business capacity and the faculty for giving attention to detail are determining factors. The beginner

is advised to regard intensive chicken-rearing as an occupation requiring skill and experience, without which success is unlikely to follow the adoption of any particular method, however admirable.

It would be undesirable, therefore, for the inexperienced to invest in a plant capable of raising 3,000 chickens in the season, though useful experience may be gained by attempting to raise, say, one-twentieth of that number. In purchasing appliances for artificial incubation and rearing, those of the size recommended by Mr. Paynter might be used with a view to future development, but there would be no necessity to work the appliances up to their full capacity. Thus a beginner might test the suitability of the system to his individual circumstances and ability by the purchase of an incubator and one brooder, and provide, in addition, the plant necessary for 100 to 150 chickens. He must not expect the financial results of this tentative effort to produce a return proportional to that indicated as attainable under the complete system, but should regard the outlay as a necessary expenditure in training.

Such a method, if carried out systematically, would not only be the means of securing some practical experience of production, but would also give the beginner some knowledge as to local demand and prices, and methods of marketing.

As is indicated in the previous article in the Journal, Mr. Paynter is now conducting, under the auspices of the Board, a demonstration of his system at Haslington Hall, Crewe. For the novice who seriously contemplates devoting attention to intensive chicken rearing, probably the most satisfactory course to pursue would be to visit, during the spring or early summer of the present year, the demonstration which is in progress. Those who wish to pay such a visit should write to inquire when arrangements can be made to receive them. Mr. Paynter's time is fully occupied, and an appointment will be necessary.—*The Journal of the Board of Agriculture.*

Agricultural Banks.

THE OBJECT AND THE WORK OF THE AGRICULTURAL BANK OF EGYPT.*

The Agricultural Bank of Egypt was established by Lord Cromer some fifteen years ago in order to free the improvident fellah from the clutches of the Greek and Syrian money-lender who, taking the fellah's land as security, advances him money at the rate of anything between 30 to 50 per cent. or more. The fellah has an inborn craving to acquire land and any neighbouring land is a Naboth's vineyard to him, to be acquired by any sacrifice and this forms one of his chief reasons for borrowing money. Other reasons are marriage and other festivals, on which he will squander large sums, more legitimate reasons being the purchase of cattle or the erection of the all-necessary water-wheel. The Bank was given the support of the Government inasmuch as that it allowed the instalments, when due, to be collected by the Government tax-collectors at the same time as the taxes were collected in the villages after the cotton harvest in October and November. The provincial governors and sub-governors also gave the Bank every support in ordering village headmen to assist the Bank's collectors in collecting arrears, and in seeing the clients in their villages, always a difficult matter when they may be scattered over their fields and are naturally unwilling to come and be worried to pay their debts, and in settling affairs generally. The Bank has a Board of Directors in London and Egypt and a General Manager and head office in Cairo. Then each Province has a branch agency in the principal towns, managed by an Englishman and native staff, and these again have sub-agencies in the smaller towns.

According to the statutes of the Bank, no client may borrow more than £E500 on the mortgage of his land and repayable at the fixed rate of interest of 8% in ten yearly instalments. This was afterwards altered to twenty years and a rate of 9% for those in arrears of payment.

FORM OF SECURITY.

As only about 75 per cent. of the fellaheen own more than five acres, nearly all the Bank's work is done with the small land-owner, even so small a portion as a ¼ of an acre being accepted as security. But land is of very high value in Egypt—no land that will bear even a poor crop of cotton can be purchased for less than £E 40 and in the older Provinces where the soil is

* The illustrations which should have accompanied this article will be found in the March number, facing page 92.

very rich, nothing can be bought under £E 120, and anywhere near towns £E 200 per acre will be paid. Rents in these Provinces will be from £E12—17 per year. The Bank only advances half the value of the land, which is generally assessed according to the Government Tax.

THE ACT OF MORTGAGE.

The mode of procedure for mortgaging land is as follows:—The fellah obtains a Bank form stating the amount of land he owns; how obtained, whether by purchase or inheritance; how much of that land is previously mortgaged; whether he himself worked the land or is it rented out; value of the land; boundaries; reasons for loan; names of heirs; and various other legal details. This form being filled out in the village, it is then signed by the headman and the clerk of the village, who also vouches for the good character of the client. The form is then sent to the bank, where it is checked according to the Government Land Registers. If it is found to be correct, an act of mortgage is then made out and an audience fixed for a certain date All the clients of that district would then assemble on the date fixed and before the Government Grèffier sign their acts, after which they received their amounts, less cost of registration. Great care has to be exercised during the signing of the acts because the fellah is up to all sorts of trickery. The fellah, as a rule, cannot sign his name, so Egypt possesses a system of seals on which is engraved the owner's full name. These seals are all registered and if lost must be officially replaced. Great care must be taken to see that the seal is the same used as that on the preliminary form and that it really belongs to the owner and secondly that it is the mortgagee himself who presents the seal and not some one else. The moment the audience is finished the names are telegraphed to the Head Office and at once registered in the Government Land books, or the mortgagee might get in a second mortgage on his land or even sell it to some unsuspecting person. In the case where a client already has a mortgage or debt on his land, with the full consent of the creditor, this sum is deducted from his new loan and paid over to the debtor. The first instalment would be due the following autumn, when the taxes are collected, but if the mortgage is only registered three months previous to the tax collecting, it would be deferred till the following year.

ARRANGING THE FELLAH'S PAYMENTS.

The Government tax collectors are given a small percentage on what they collect during two months, after which a list of all defaulters is sent into the Bank, through the Government. The Bank then sends out its own collectors to endeavour to induce the defaulters to pay and the English Inspectors are constantly visiting the villages to use their influence and to point out to the fellah the best way to arrange his payments. And it is this point which makes an undertaking of this sort, so sound—the English Inspectors make a point of seeing the clients individually and seeing that

justice and fair-play is dealt out to the fellah. And considering the ignorance of the fellaheen it is most important that these matters should be in the hands of men of position and high-standing, for the fellah has to trust blindly to the proper keeping of his account, the complications of which—especially when he falls into arrears or can only pay parts of back instalments—with its compound interest are far beyond his simple methods of calculation. And such is the high standing of the Bank, they *do* render implicit trust. As long as everything is straightforward the fellah keeps up his yearly payments well on the whole, but the two chief factors for his getting into arrears seem to be either the death of the original owner and consequent division of the land amongst innumerable heirs who cannot agree amongst themselves as to their share of payment, or the mortgagee selling his land to third parties who cannot agree as to payment.

If a man gets into arrears, he may re-mortgage his land for a further period of 20 years, the remaining amount of his original loan, plus the interest on his arrears being deducted from his new loan.

Otherwise if he gets into arrears for 2 or 3 years and it is thought not desirable to accept a re-mortgage, legal proceedings are then instituted for the expropriation of the land.

And it is here that the chief weakness of the Bank's smooth working occurs. For the Bank, being a European Company, all its legal work must be done through the Mixed Tribunals which causes endless delay. It will take as long as three years to expropriate a man of half an acre of land. One of the chief reasons of this delay is supposed to be to give the debtor time to pay off his debt, but in reality it often means that the procrastinating fellah will put off the payment as long as possible, thereby incurring very heavy legal expenses, the payment of which in the end severely cripples him. If expropriation were swifter the fellah would not be so inclined to put off the evil hour of payment.

BLACK-LISTING A VILLAGE.

In certain cases the Bank also lends small loans on note of hand only payable in one year, these loans being chiefly for manure or seed and which are nearly always paid up. It is curious that in the same district and where land is of the same value, of two villages within a mile of one another, the one will have no clients in arrears whilst another will have more than half. In the latter case the village is black-listed and no further loans advanced in that village. The fellah often possesses the money to pay off his debt, simply delaying, doing so beacuse for him to part with his money is more than drawing his blood and it is in these cases where the English Inspector can often persuade him to pay by reasoning with him or by threats of expropriation.

Thus it will be seen that the Agricultural Bank of Egypt is a thoroughly sound concern that has done and is doing a great work for the benefit of the fellah. But it is also a sound financial business, for though Lord Cromer looked upon it as a more or less philanthropic concern, it pays a regular 7 per cent. to its shareholders.

THE NEW LAW.

Now let us see what effect the new Law, passed at the beginning of this year, will have on the Bank. The Law ordains that it is not legal for owners of less than five acres to mortgage their lands, the idea being to force provident measures on the fellah by stopping his only source of security thus rendering it practically impossible for him to borrow. For it must be remembered that only 25 per cent. or thereabouts own more than 5 acres. It was also maintained that the profit gained from less than 5 acres was insufficient to support the mortgagee in the common necessities of life, as well as to allow him to pay off his debt, thus getting him further into debt and into the power of the money-lender.

But the relatively small number of clients and arrears to the Bank show this is not really the case.

But the fellah must be financed somehow; money must be advanced to him for seed and to cultivate and move his crop. It has been his custom fo countless generations to borrow for these purposes and suddenly to put a stop to this and to cut off all his resources of financial help does not seem a very wise step.

During the months preceding the passing of the Law, there was a tremendous rush on the Bank to borrow money and the output amounted to a very large sum. But it was impossible to cope with all the work before the date fixed and many thousands of fellaheen could not get their small holdings mortgaged in time. In consequence of this the money-lenders to whom they were indebted, were simply forced to seize their crops, having no security for repayment of their debts.

A commission has been instituted by the Government to obtain, in detail, the indebtedness of the fellah. This in itself is a stupendous undertaking, for if there is one thing the fellah hates it is exposure of his private debts. *Secondly* very few of them have the remotest idea what their various debts amount to, nor even how much of their land they have mortgaged to various money-lenders. *Thirdly*, as they neither give nor receive receipts for ordinary debts, there will be nothing to show the commission the truthfulness of the amount of the debt. In order to meet this, a most arbitrary act was passed whereby the unfortunate fellah should be fined and imprisoned if he should be convicted of lying or falsifying the statement of his *private* debts. It is presumed that when this commission has computed the fellah's indebtedness, that the Government proposes in some way to recognise his debts. But what the Government does not seem to realise is that the debt is computed at at least 60 million pounds and this from such a small country as Egypt and with 12,000,000 inhabitants. The Government certainly does not possess

this sum itself to settle the debt, nor can it expect to borrow it from London or Europe when it has itself just deliberately put a stop to the work of so excellent an institution as the Agricultural Bank, which itself was instituted and supported by Government and backed by high financiers.

D. S. C.

AGRICULTURAL CO-OPERATIVE CREDIT SOCIETIES AND JOINT STOCK BANKS.

The following extracts are from the *Journal of the Board of Agriculture*, February, 1913 :—There is a general concensus of opinion that the Co-operative Credit Society is the most satisfactory means by which capital, from whatever source received, can be passed on to the small holder, who stands most in need of assistance in the matter.

As regards the extent to which the banks will be prepared to provide a Society with capital, each bank naturally reserves to itself the right of requiring in each case satisfactory evidence as to the security for the loan; and, indeed, no sound banking institution, whether State-aided or not, could be expected to make an advance of money to a Society without making sure that there was a practical certainty that the advance would be paid.

As regards the form of security to be required, the banks have agreed that the joint liability of the members of the Society may be accepted as an adequate security for a proposed loan, without any further guarantee for its repayment; subject, however, to the general condition already mentioned, that the bank is satisfied that the joint liability is in the particular case a sufficient security. It is to be expected that when a Society wishes to take advantage of this arrangement and obtain a loan from a bank without any special guarantee, the local bank Manager and the Directors will require to be satisfied that the Society consists mainly of thrifty, industrious men, that the Committee is composed of trustworthy members of good character and credit, that the affairs of the Society are conducted in a business-like manner, that the loans to members are really expended on profitable agricultural purposes, and that these loans are punctually repaid on the due dates. Indeed, in the interests of the co-operative credit movement, and of the individual members of the Societies, it is not desirable that any institution should make advances to a Society which cannot fulfil such conditions.

As already said, the arrangement made with the Banks relates only to Co-operative Credit Societies, so that if the members of any other form of Agricultural Co-operative Society wish to take advantage of it, it will be necessary for them to combine their credit by forming an entirely separate Credit Society, confining itself solely to the business of making loans to its members for profitable agricultural purposes. It does not reduce their existing facilities for borrowing money, whether from joint Stock Banks or from other sources. All that it means is that these banks have now expressed their willingness to give valuable assistance to Agricultural Co-operative Credit Societies on favourable terms in cases where approved Security can be given.

CO-OPERATIVE CREDIT IN INDIA.

In India, with its immense area and its population of 315 millions, the cultivation of the land is almost entirely in the hands of small holders, farming from 1 to 50 acres each. Many of them own the land they cultivate; but even where this is the case, they find great difficulty in obtaining at a reasonable rate of interest the capital they require to borrow in order to carry on their agricultural operations. In many parts of the country the ordinary rate of interest charged to the peasant by the village money-lender, who is the main source of supply of credit, is from 30 to 40 or 50 per cent. per annum, and for the whole of India the average rate is somewhere in the neighbourhood of 20 per cent. These high rates are due to the precariousness of the harvests, to the scarcity of capital available for loans as compared with the demand, and to the unsatisfactory relations between the money-lenders, who often take advantage of the ignorance and illiteracy of their debtors, and the peasants, who struggle to avoid the exorbitant claims of their creditors and are often unpunctual in the repayment of their debts.

With a view to improving the security of lenders and reducing the rate of interest payable by borrowers, the Government of India in 1904, after a careful study of the experience gained in various European countries, resolved to introduce the system of co-operative credit, which had been so successful elsewhere, and passed a Co-operative Credit Societies Act, based upon that experience and upon the Friendly Societies and Industrial and Provident Societies Act of the United Kingdom, with such changes as were necessary to adapt them to Indian conditions. That this measure has proved a success beyond the dreams of its most enthusiastic advocates, will be seen from the following statistics for the year 1911-12.

In that year the total number of co-operative societies in India increased, from 5,432 to 8,177, the number of members rose from 314,000 to 403,000, and the total working capital from £1,358,000 to £2,238,000. The amount sued in loans to members during the year was £1,191,000. It must be remembered that a pound in India means much more than it does in England as may be realised when it is considered that the average daily wage of an unskilled agricultural labourer is about 3d. in India, while in this country it is about 2s. 6d., or ten times as much. The amount lent by societies to their members last year would, if spent entirely in wages, have enabled them to employ 95 million days' labour, and if spread over the total number of members, would have provided each of them with enough to pay the wages of a labourer for two-thirds of the year.

The societies are divided into three classes—central, urban and rural—and the following figures relate to rural societies, which are almost entirely composed of small cultivators living in villages. The number of these rural societies increased during the year from 4,957 to 7,562, the number of members from 236,000 to 325,000, and the working capital from £727,000 to £1,215,000. During the year members deposited with the Societies £85,000 and repaid loans to the amount of £503,000. Deposits were withdrawn to

the amount of £52,000, and the new loans made to members amounted to £935,000. The earnings of the year, which consisted almost entirely of interest on loans to members, were £115,000, and the charges of the year were £73,000, so that the societies during the year made a net profit of £42,000. At the end of the year the total assets of these rural societies amounted to £1,295,000, of which £1,112,000 were out on loans to members. Their liabilities to persons and bodies outside the societies amounted to £853,000, including £658,000 due to central banks and other societies, £126,000 borrowed from non-members, and £51,000 lent by the Government in certain parts of the country, so that, after deducting these liabilities to outsiders, the societies and their members between them ended the year with net assets of the value of £442,000, which represents the sum which the establishment of these credit societies has enabled their members to lay by in the course of the last eight years. Of this amount £300,000 were due to individual members in the form of share capital, deposits and interest, and after allowing for this amount and some other small items, the societies, as such, possessed £140,000, which represents their profits to date from the commencement of the different societies.

This satisfactory result is due mainly to the success of the societies in obtaining advances and deposits, either from members or non-members, at a considerably lower rate of interest than they charge on loans to their members. The rates which the Societies find it necessary to pay in order to secure the capital required for their working vary from about 6 to 10 per cent., and average something like 7 per cent. for the whole of India; and the rates charged by the Societies on loans made to their members vary from about 10 to 15 per cent., and average for the whole of India approximately 12 per cent. The amount of interest earned by societies during the year exceeded the amount of interest paid by them by £45,000, which left them a margin of profit of nearly 5 per cent. on the amount borrowed by them from all sources; and as the committees which manage these societies perform their work without payment, the total cost of administration for the whole of India came only to £8, 000, or a little more than £1 per society for the year. Thus the members of these societies have not only found them a safe place of deposit for their savings, but have been able to borrow the small loans they require at a rate of interest which, though it seems high in comparison with the rates current in Western countries, is only about half the rate they used to pay to the village money-lender. The more successful societies, which have built up a large reserve fund, are now beginning to reduce the rate of interest they charge on loans to their members.

The indirect advantages of the movement are also very marked. The establishment in a village of a successful credit society among the peasants themselves has greatly reduced the demand for loans from the village

money-lender and compelled him to lower the interest he charges to othe persons who still resort to him for loans. The manifest benefits gained from co-operation in the matter of credit are encouraging the villagers to combine for other purposes, and one hears of co-operative societies formed for the provision of good seed or improved implements, for the purchase of members' requirements, and for the sale of their produce. Some societies have even begun to take up land for demonstration farms, to build village halls, and to start village schools for the benefit of their children. It is also noted that these societies play an important part in the prevention of disputes and litigation, and bring the people together in friendly fashion, so that the practice of co-operation is having a marked influence on the effacement of old enmities and the development of social intercourse among the villagers. The movement is rapidly spreading, and promises to revolutionise village economy throughout the country, by increasing the welfare and raising the intellectual and moral standard of the masses of the people.—*The Journal of the Board of Agriculture.*

CO-OPERATIVE CREDIT.

A community maintains its stability by the energy it displays in *productiveness.* Unless the standard of productiveness is fairly high, and the capacity for producing is well-sustained, it does not require a prophet to say that, given the necessary allowance of time, the community will gradually tend towards decay and eventually retire into the backwaters of annihilation.

The reflective mind will at once grasp the situation as the result of a law which is relentless in operation, and permeates all life in the world. Exercise a function and it lives; neglect it and it dies. This is the inevitable law of the universe.

If we take a survey of life as it exists in Ceylon at the present day, we find that the staple of the country is supplied by India and Burma. The indigenous production of rice has hardly been sufficient to supply a hundredth part of the local demand.

The immigrant labourers and the men who live in cities and townships are entirely dependent on the supply from the neighbouring continent. Imagine for a moment a season of drought and famine in India, and a consequent stoppage of the imports of rice into Ceylon, and you will realise what a disaster will befall the country.

How can the Ceylon agriculturist be induced to produce sufficient rice at least for home consumption? There are two fundamental problems to be solved before that question is answered.

It is well-known that the Ceylon cultivator, especially in the interior, is a *conservative* worker. Methods of agriculture which prevailed in the early dawn of civilisation are still followed. It is, of course, to be admitted that in following these conservative methods, the *goiya* is unconsciously putting into practice the concentrated or accumulated wisdom of centuries.

But, does the man receive at the same time that intelligence which is necessary to enable him to tap the sources of wealth, which nature has lavishly stored up for him?

The reply to this question has to be given in the distinct negative.

What we, of the present day, do not realise is that the kings of the old time were patrons of all the arts and sciences, and even of religion.

The kings, therefore, initiated with the help of their advisers and ministers all changes rendered necessary by the ever-altering conditions of life.

The age in which we live rather demands efficiency in the individual.

Hence the need for education. No reform can ever be effected in the production of rice, unless and until the youths of the agricultural classes are taught to exercise their intelligence, and the faculty of initiative, in the village school.

It is a hopeful sign of the times that this is being done by the British Government. It is the rule rather than the exception to see attached to every village school an experimental garden.

Much more can, however, be done; and the people must, like Oliver Twist, ask for more before they can have it. Healthy, legitimate and constitutional agitation will ever find a response, if maintained unabated up to the psychological moment.

The next is the question of capital and that brings me to the subject of this article—"Co-operative Credit."

History has repeatedly shown us that when an ancient community comes in contact with the civilization of a more progressive one, the members of the former community almost immediately assume an individualistic tendency, and abandon the earlier communistic ideal.

This is just what has happened in Ceylon since it came in contact with the West, and the result is that a new hatred which never existed before, for a time, set class against class.

The time of redemption is, however, drawing nigh. The people of the country have at last evolved a *national consciousness*, and each day sees a greater change overtaking the outlook on life.

In 1910 was enacted an Ordinance to promote the inauguration of Cooperative Credit Societies. The latest newspapers record the fact that Mr. R. N. Lyne, Director of Agriculture, has been appointed the Registrar of the Societies.

It will, no doubt, interest my readers to know whence the thought of Co-operative Credit originated. It is recorded that when His Holiness the present Pope was the Vicar of a parish in Venice, he was for a long time disturbed in mind over the great poverty of his flock, and the sordidness of their surroundings. The staple industry of the parish was viticulture, or the culture of the grape. Vines, several hundred years old, existed in the plantations, but at this particular period (the early "eighties"), these vines, from lack of manure, gave but an ever-decreasing yield. The depressed cultivators could hardly keep themselves and their families in comfort, much less afford to the vines the manure that was needed.

The saintly Priest Sarto began discussing the problem with his friends, and at last determined to start an agricultural bank, which would provide his people with the necessary funds to purchase their manure.

Steadily the depressed community began to rise, and it is said that when the Priest left Venice his parishioners had emerged from entire destitution into a fair command of wealth.

As these agricultural banks continued their work, it was found that the community served by them responded with greater enterprise if it provided some part of the capital, that is to say, co-operation by the community set before it such an ideal of self-help, that the capital lent to the individual was used to greater advantage, and expended with greater care. The Agricultural Bank was soon superseded by the Co-operative Credit Society which is working wonders all over Europe.

A depressed community need never despair. Co-operation has moved mountains in the past, so can it move them in the future.

The idea of co-operation has caught on in India, and it is now an ordinary sight to watch cultured and patriotic Indian youths pleading with their countrymen, and pressing upon them the claims of these societies.

The merit of the local Ordinance is that it can be applied to any trade or industry. The only moving force required is the banding together of ten men who agree to contribute the amount of capital necessary to carry on with greater efficiency the particular trade in which they are interested.

The prospect of Ceylon taking its place in the front rank of production is very bright, if only co-operation, as an energising principle, is generally adopted.—*The Rivikirana.*

MILK.

THE PRODUCTION OF CLEAN MILK ON TWO LARGE DAIRY FARMS.

The following extracts are culled from the *Journal of the Board of Agriculture* for February, 1913:—

The Kelmscott herd of pure-bred dairy Shorthorns is said to be the largest in the country, and the system on which it is kept is an example of the steps taken on good dairy farms to ensure the healthiness of the stock and the purity of the milk. The owners, Messrs. R. W. Hobbs and Son, sent milk to London daily from more than 200 cows, and farm an area of 2,144 acres in contiguous holdings in Oxfordshire, Gloucestershire and Wiltshire, on a considerable variety of soil.

MEASURES TAKEN TO ENSURE THE CLEANLINESS OF THE MILK.

In 1909 all cows and heifers in milk were tested for tuberculosis, and since that year the stock has been tested annually. So far, only eight animals have reacted, and six of these were stock not bred at Kelmscott. No cow that reacts is allowed to contribute to the milk supply. In 1911 a valuable cow that had reacted was sent to the knacker, and a post-mortem examination fully justified the destruction of this animal.

Careful milk records have been kept for many years, and every cow's milk is weighed daily. The milkers have clean smocks twice a week, the smocks being provided and the washing done by the firm. The men are required to wash their hands before and after each milking, and it is proposed to provide them with paper or washable caps. During most of the year the cows are groomed before milking, and the udders are washed. The tails, udders and hindquarters are kept clipped. The Dutch system of tying up the cows' tails has been considered, but as the gutters behind the animals are cleaned twice a day, it has not been thought necessary to introduce it. The buildings to which the milk is taken are cut off from the cow-houses, so that cattle do not pass them, and there is very little other traffic. The milk is not pasteurised, but is simply cooled. On the day I visited the cooling house the milk was 92° F. on entering the cooling apparatus, and 58° F. on coming out into the railway churns. Between the cow and the churn the milk is filtered four times.

Although there are a dozen milking machines in use within a radius of ten miles of Kelmscott, they have not yet been adopted here, as it is felt that the trouble of keeping milking machines clean, the risk of cups falling from teats, and the danger of blood passing with the milk owing to a temporary ailment of a cow, are arguments of some weight against machines, especially when no great difficulty has been experienced in obtaining a sufficient supply of men to milk.

The cow-houses are all particularly airy, and some of the old houses are open in front.

Last year a good deal of peat moss litter was used. The peat litter has cost 33s. 1d. per ton delivered. A ton goes as far as 3 tons of straw. Wheat straw has cost about 50s., while sawdust, the supply of which is insufficient, has cost 15s. per ton. As far as possible, straw is fed to stock instead of being used as litter. The straw is chaffed by the motive power used for the threshing, and is carried away in specially boxed carts. As much manure as practicable is made under cover, and when possible above a good depth of road dirt. Liquid manure is saved whenever possible.

STAFF.

The staff consists of a foreman at one of the farms, studsman, herdsman blacksmith, 3 carpenters, 7 shepherds, 24 milkers and cattlemen, 5 lads to clean cows and cool and weigh milk, 12 carters and under carters, 15 lads and boys with the horses, 6 day-labourers who work with the threshing machine or clover huller through the winter, about 22 day-labourers, and 4 grooms and gardeners who help in hay-making and harvest. Total 102.

FEEDING.

The rations fed to the cows vary greatly according to the value of the different feeding stuffs, but the following tables indicate average feed :—

Winter.	Summer.
3 lb. dried grains	2 lb. cotton cake
3 lb. mixed beanmeal and oatmeal.	1 lb. soya bean cake
3 lb. cotton, soya bean, and dairy cake, mixed.	1 lb. dairy cake.
9 lb. per day for thirty weeks.	4 lb. per day so long as the animal gives 2 gals. daily.

AVERAGE MILK YIELD.

The average milk yield per cow per year for the three years ending September 30th, 1911, was for 134 cows, 6,015 lb., this being the lowest average for many years owing to the summer drought. The average yield per cow for 1910 was 6,330 lb. ($10\frac{1}{4}$ lb. to the gallon), and for 1909 6,500 lb. The average yield of an average farm cow in Great Britain is, perhaps, 4,500 lb. During the past three years there have been on an average fifteen cows milking at Kelmscott yielding about 1,000 gallons or over. Rose 26th yielded 13,903 lb. from June 10th, 1904, to June 10th, 1905. At Tring Show she gave $72\frac{1}{2}$ lb. 6 oz. in 24 hours. Blossom 5th, between December 28th, 1898, and September 2nd, 1908, produced 10 calves. Her average annual yield for ten years was 8,049 lb., and her total yield 86,523 lb. The herd has been bred for milk since 1878, and cows and heifer calves are rarely purchased.

The yield of 600 gallons is regarded as much above the average yield of the average cow throughout the country. On the other hand, the cost of feeding and attendance at Kelmscott is perhaps somewhat higher than in the case of most farmers. The figures show clearly the advantage of keeping a 700 gallons instead of a 500 gallons cow. The former would give a net profit of £3 14s.6d., while the latter would give a loss of £2 2s.2d. Nothing is charged in the balance sheet for chopped straw and litter, as the manure obtained is believed to be of equal value.

A NEW MILKING MACHINE.

A QUEENSLAND INVENTION.

In the advertising columns of the *Queensland Agricultural Journal* of February, 1913, will be found particulars of the first Queensland invented and patented milking machine. The invention is by Mr. R. E. Shepperson, an up-to-date young dairy farmer, who, first of all, installed an imported milking machine, and, while overcoming certain difficulties with it, gradually improved and built up a simple and entirely new type of milker. In this he has had the assistance of Messrs W. A. Preston & Co., well-known throughout the State as providers of first-class dairy machinery. The "Shepperson" milking plant consists of a vacuum pump, vacuum tank, line of piping over the bails with vacuum gauge, safety valve, and gun-metal pulsation, and vacuum taps of simple and effective design, nickel-plated to ensure cleanliness. The claw is also of gun-metal and plated; and this, with the special teat-cup inflation, may be said to be the live part of the "Shepperson" invention. Each teat-cup is supplied with a tap, and when the cup hangs down the tap is shut, and the vacuum "off." As each cup is raised to attach to the teat, the tap opens, and the vacuum is "on." Thus, one teat or more may be milked at a time; in fact, in one herd milked by the "Shepperson" patent is a cow with only two teats. She is milked with the ordinary claw, with two cups hanging down and thus automatically shut off. The rubber inflation is perhaps the most important part of the plant. It is unique in design, being oblong in section constructed with longitudinal threads to prevent elongating, and with steel spring insertions embedded in the rubber to control the action on the cow's teat and imitate the action of the hand in milking. Shepperson milking plants are being installed on the Northern Rivers of New South Wales and in different dairying centres in Queensland. Orders are now coming in faster than the machines can be made, and special machinery is being put down in Brisbane to cope with the work. The inventor and manufacturers are to be congratulated on their enterprise, especially as the Shepperson machine has already proved capable of making so effectively as to be used with equal satisfaction during the slack months of winter and in the full supply of summer.

SOME FACTORS AFFECTING THE BACTERIOLOGICAL CONTENT OF MILK.

The objects of these experiments were to obtain additional information on the various factors which influence the bacterial content of milk, with a view to the fixing of a bacterial standard for clean milk, and to demonstrate the more important sources of bacterial contamination together with the methods of avoiding them. Contamination in the byre has already been shown to be the most important, and the inquiry was limited to this, contamination during transit not being dealt with. The work was carried out with the herd of the Edinburgh District Lunacy Board at Bangour Village Farm.

EFFECT OF GROOMING COWS.

The cows were groomed an hour before the evening milking, and the number of bacteria in the milk was found to average 2,464 per c. c., compared with 9,827 per c. c. at the morning milking, which was fourteen hours after the grooming. With cows that were never groomed, however, the number of bacteria was over 125,000 per c. c. There was therefore a reduction of 98 per cent. in the total contamination as the result of grooming.

EFFECT OF BRUSHING THE UDDERS.

Brushing the udders of the cows immediately before milking, in addition to the ordinary grooming, was found to increase the bacterial content of the milk greatly. When the brushing was done three-quarters of an hour before milking there was still no advantage from the brushing. This method of treating the udder is therefore unsatisfactory, owing, no doubt, to the dirt particles on the udder being loosened so that when milking begins they fall into the milk-pail.

EFFECT OF WASHING THE UDDERS.

When the udders were washed with soap and water and left moist, a large reduction was effected in the number of bacteria. The average number in samples of the milk of four cows treated in this way was only 1,125 per c. c.

BACTERIA IN THE AIR.

Foddering and grooming the cows, and the removal of manure from the byre during milking increased the number of bacteria in the air considerably.

THE KEEPING OF MILK.

Cooling the milk immediately after milking resulted, as was to be expected, in a smaller number of bacteria than when it was allowed to cool naturally. For example, two samples of milk, one of which was cooled immediately after milking to 50° F., and the other allowed to cool in the air to 64° F., showed a vast difference in the bacterial content. The samples

were kept approximately at the above temperatures for twenty-four hours, and at the end of that time they contained respectively 128,000 and 874,000 bacteria per c. c.

A large number of samples of the mixed milk of the herd at Bangour were taken as the milk left the byre, and the average number of bacteria found in them was about 47,900 per c. c. In a number of milks from town dairies which were also examined the average was about twice as high. The following recommendations for clean milk, based on the experiments, are given:-

1. The fore milk should be rejected.
2. The cows should be groomed daily, and their udders should be washed before milking.
3. Foddering with dusty fodder, removal of manure, and all operations which raise dust and so increase the bacterial content of the air of the byre, should be done after milking, or several hours before.
4. The byre should be cleaned twice daily, and the floor flushed with water before milking.
5. The ventilation and the lighting of the byre should be efficient.
6. The milkers should wear clean overalls during milking, and should wash their hands at the commencement of milking, and also after the milking of each cow.
7. The milk should not be allowed to stand exposed to the air of the byre after milking. It should be removed to a cool, clean dairy, where it should be immediately cooled to 10° C. (50° F.), and kept cool.
8. All milk vessels, &c., should be thoroughly sterilised with live steam, and should not be allowed to stand in the byre before milking begins. They should not be rinsed with cold water or wiped with a cloth after steaming, but simply set up to drain.
9. The use of unclean cloths is a frequent source of bacterial contamination, and should be carefully avoided. *Alexander Lauder and Andrew Cunningham, in the Edin. and E. of Scotland Coll. of Agric. Report 28.*

THE PLANTING GAZETTE.

The Planting Gazette is the outcome of a resolution passed at a General Meeting of the Planters' Association of Ceylon that a periodical be founded to serve as the official organ of the Association, with the Secretary as Editor and the Chairman and two members as a controlling committee.

The first issue (March) is a creditable production and, departing from usual custom, does not open with an apology; no apology indeed is needed as not only is the publication in experienced hands but it fulfils a distinct want.

The *Foreword* explains the need for such an official organ, and the lines upon which it is to be run. One thing appears to be clear and that is that the Planting Gazette is going to attend to planters' business and not matters which do not concern the Association it represents. As a medium for the interchange of ideas on technical planting questions the magazine is bound to serve a very useful purpose.

There is naturally a good deal of space devoted to the Coast Agency, this being at the present time a subject of prime importance in view of labour troubles on our plantations. Mr. Sheridan Paterson's scheme for dealing with cooly advances is thus referred to: "Not that it is perfect: if it were perfect it would in all probability have been adopted long ago; but because it is a genuine thoughtful attempt to get to the bottom of one of our most pressing problems."

To the lighter side of the Magazine Lieut-Col. Gordon Reeves contributes an entertaining account of the C.M.R., and his appeal for National Service deserves notice. "Are British born men in this Colony going to recognise their duty and prove themselves worthy of their name?" he asks, and declares "if not, the sooner they expatriate themselves the better for honest citizens."

To Mr. G. C. Bliss belongs the credit of obtaining the formal decision of the Association to found the *Gazette*.

VEGETABLE OILS.

Essential oils used in perfumery have advanced considerably in value, and especially Athar of Roses, says the *Gardners' Chronicle*. The following list of oils and their sources appeared in a recent issue of *Knowledge*:—Turpentine, Pinus Australis and Pinus taeda; juniper, Juniperus communis; Myristica fragrans; cassia, Cinnamomum cassia; cinnamon, Cinnamomum xylanicum; camphor; Cinnamomum caphora; mustard, Brassica nigra; rose, Rosa damascena; bitter almond, Prunus amygdalus var. Amara; lemon, Citrus medica; orange, Citrus aurantium; bergamot, Citrus bergamia; rosemary, Rosmarinus officinalis; lavender, Lavandula vera; peppermint, Mentha piperita; eucalyptus; Eucalyptus globulus; bay, Pimenta acris; and cloves, Eugenia caryophyllata,

COTTON.

THE WORLD'S SUPPLY.

It is very natural with a staple like cotton, which is so necessary to the welfare of mankind, that every considerable Government should seek, if possible, to raise its own supply. The various European Governments have long tried to devise methods of being independent—to some extent at least—of the American product. One-third of the world's supply of cotton comes from Egypt and India; but notwithstanding this fact, England has made constant efforts to develop a profitable production of cotton in various other territories under English control, and Russia has expended a great deal of effort in the attempt to produce cotton profitably in Central Asia. These various attempts have been successful as far as producing cotton is concerned, but they have not been altogether successful in producing it at a figure that can compete with the cost of its production in the United States; and when the price of cotton in our Southern States has been low these rival efforts in other countries have been attended with much discouragement.

In the last 25 years the average export price of cotton from the Southern States has been 9·3 cents—the lowest price was 5·5c. in 1899, and the highest price during the last 25 years was in 1910, when the export price rose to 19·7 cents.—*The India Rubber World.*

THE FUTURE OF AMERICAN COTTON.

Cotton spinners of all countries have for so long been dependent upon the United States for their supplies of raw cotton that American cotton growers, merchants and exporters have been led to believe that this state of affairs would continue indefinitely, and that the United States would fix the cotton prices of the world. Of the world's total consumption of raw cotton in 1911, which amounted to 19,013,000 bales, the United States supplied 11, 408,000 bales, or almost 60 per cent., and all other countries only 7,600,000 bales. Such conditions, as is well known, have led to excessive gambling by speculators, which has so inflated prices as to be a serious menace to spinners, whose only hope is to be found in a free market, uncontrolled by speculative competition, with a supply furnished by many producers. Whether that hope is likely to be realized is considered in an interesting article by Mr. John V. Hogan in the *Journal of Political Economy*, of Chicago. He discusses the success that has so far been obtained in the various countries where cotton is produced and shows that, besides the great producers fifty years ago, seventy-two other countries are producing and exporting cotton on a rapidly increasing scale. Apart from India, Egypt, China, and Brazil, the remaining countries, where the industry is largely of recent development, have increased their production and exports from 797,550 bales in 1900 to 2,886,177 in 1910, an increase of over 260 per cent., and they are developing now at an even more

rapid rate. In the same period the increase in the United States crop was only 17 per cent. There are probably no less than 1,800,000 square miles of good lands into which cotton culture is being profitably introduced in Russian and Chinese Turkestan and Mongolia, Mesopotamia, Uganda, and British East Africa, Rhodesia and Nyasaland, the Anglo-Egyptian Sudan, Abyssinia, the Congo, Nigeria and Madagascar. This means an area over thirty times as large as the entire cotton acreage of the United States in 1911, and yet it does not include sixty other cotton-producing lands which may be able to supply an equally large cultivable area. In the near future, therefore, it is probable that cotton will be growing in a great number of countries in sufficient quantities to meet the world's requirements, when the price will no longer be controlled by speculative interests. Mr. Hogan thinks that, under these circumstances, the future of the American cotton trade is now in the balance. The world's spinning industries, which have suffered so severely from the manipulation of the American cotton exchanges, have determined to obtain relief at any cost from further American control of the fibre. Much has already been done in that direction, and what the future will bring may be plainly foreseen. In 1889 the United States produced 63½ per cent. of the world's output of cotton, in 1909 it was 59½ per cent., and in 1912 it will probably be about 58½ per cent. Apparently it will not be many years before the American crop will be less than one-half of the world's production, and unless the United States can greatly increase its crops by improved methods of cultivation and will sell the output at reasonable competitive prices in the open markets of the world, it will have to take a lower position in the list of the world's suppliers of cotton.—*The Chamber of Commerce Journal.*

THE COTTON TRADE IN 1912.

The annual meeting of the Manchester Chamber of Commerce was held on February 3rd, Mr. W. T. Stubbs presiding. In the course of his observations the Chairman remarked:—I have again to congratulate the members on the further progress and prosperity of our great cotton industry, an industry affecting directly or indirectly some ten million of the people of this country. This year 1912 will probably rank in the history of the trade as a phenomenal year. A record crop of 16,000,000 bales of American cotton assured an abundant supply of raw material. The exports of cotton piece-goods in 1911 had exceeded those of 1910 by fully 10 per cent, which presumably had brought the markets of the world near a state of repletion. These prime factors, by ordinary precedents, pointed towards a year of low prices, but the actual experience has been very much to the contrary. The price of American cotton, opening, at 5·10*d.* for middling on January 2nd last year, had risen to 7½*d.* by July, and remained in the region of 7*d.* for months afterwards. The exports of cotton piece-goods again rose from 6,654 million yards in 1911 to 6,913 million yards in 1912, an increase of about 4 per cent. Exports of yarn increased from 224 million pounds to 244 million pounds, an increase of rather more than 9 per cent. The total value of exports of

cotton manufactures advanced from £120,063,000 in 1911 to £122,228,000 in 1912. Analysing the distribution of cotton piece-goods exports in 1912, it is at once evident that we are indebted to India for the continued expansion and the maintenance of a high level of prices. India has been blessed with four years of agricultural prosperity. Abundant crops have made food plentiful and comparatively cheap. Her exports by sea of home-grown produce have risen from an average annual value of £110,000,000 in 1906-09 to £136,000,000 in 1909-12 (years ending March 31st). To this increase in national wealth, and in some measure to the enterprise of the native merchants, many of whom are now direct importers, and partly to the reaction from the Swadeshi movement, leading to an increased use of imported clothing, the extraordinary and apparently insatiable demand for Lancashire cottons must be attributed. Our exports to India in 1912 were 2,795 million yards (40 per cent of the gross exports), being 374 millions, or 15½ per cent increase on 1911. For the rest of the world there was a net falling off in 1912 of 116 millions, the principal shortcomings being to China and Turkey. Most spinners, manufacturers, and merchants can look back upon an unusually profitable year. The coal strike in the spring caused serious inconvenience, and retarded production to an extent that affected time contracts for months afterwards. Other labour troubles have had to be faced, but, happily, they have not been prolonged or widespread. The present position of producers is on the whole strong and healthy, barring fresh labour troubles. Current contracts secure full employment for the bulk of the machinery for at least the first half of the year, and, although we cannot hope for such a superabundance of raw material as was experienced last year, there seems to be no fear of scarcity, any anxiety centring more upon the question of quality rather than quantity.—*The Indian Trade Journal.*

COTTON AND SUBSOIL WATER.

Writing in the *Manchester Guardian*, "J. A. T." says:—

It is satisfactory that the state of affairs with regard to the Egyptian cotton crop should now have passed from the stage of controversy as to the causes of the 1909 crop disaster to that of general agreement and the adoption of actual remedies. The publication of the results of these experiments carried out by officials of the Egyptian Survey Department in 1911—"The Effect of Water on the Cultivation of Cotton," by H. T. Ferrar and H. E. Hurst, fully confirms the importance of subsoil water as one of the main factors in the yield of cotton, and should finally dispose of the question, at least as one of principle.

The experiments consisted of (1) observations of strips of cotton grown on land under which there was known to be a sloping water table, so that the effect of different depths of subsoil water on the yield could be ascertained; (2) similar observations and comparisons of the depth of the water table and the yield of cotton at a number of places throughout the Delta during 1910 and 1911; and (3) a weir discharge experiment to determine the quantity of water actually led on to a cotton field.

The strip experiment showed conclusively that there is a steady increase in the yield of cotton as the thickness of the layer of soil above the water table increases. Down to about two metres depth an increase of one metre in the depth of the water table produced an increase of about 1.9 kantars of seed cotton (equivalent to about 0.6 kantars of lint) per feddan, and the yield obtained from plots with more than two metres clear soil was nearly double that of plots with a water table of less than one metre. As the thickness of the layer of soil clear of water increases all the factors which determine the magnitude of the crop improve—*e. g.*, number of flowers produced, percentage of flowers which become ripe bolls, lint weight per boll, height of plants, weight of a single seed and number of seeds per boll. The experiments further confirm the fact that damage was caused by the rise of the water table at the end of the summer—*i.e.* on the arrival of the flood. In this case, contrary to opinions previously held, the loss is said to be less than that due to a general high level of the water table, but the effect of the rise depends upon the time at which it occurs—the earlier the rise the greater the damage.

The result of the second series of experiments throughout a wider area is strikingly similar. At first the yield of cotton increases as the depth of the water table increases but after certain depth is reached the yield tends to become constant. The position of the *optimum* depth apparently varies greatly with the locality. In three out of five cases the evidence seemed to point to the advantage of two metres depth, but in one case one metre seemed sufficient. There is no reference made to the effect of climate on this point. In view of the facts recently published by Mr. W. Lawrence Balls as to the effect of temperature in acceleration of root growth, it may well be that the shallower water table would be found sufficient in the north. It will be fortunate if this is so, for it is just in the low-lying lands to the North that it is most difficult to obtain a deep water table even by the most efficient drainage possible, and the Government drainage schemes for these districts at present under way are based on a minimum of one metre.

The chief interest of the third experiment is that the amount of water found to have been put on the land was rather less than the amount used in agricultural practice, and the result was a better yield. It is to be hoped that during the past season these experiments have been continued at the other end to show how far the reduction of supply can be carried without diminishing the crop. There is a considerable body of opinion evident this year that the water famine of the early summer (for it really amounted to that in certain districts) did harm by forcing the plant. The exact balance between supply and over-supply has still to be struck.

It is unfortunate that so far sufficient data do not seem to be available to justify any opinions as to the effect of water conditions on quality. The Government's inquiries upon this point ought to be pressed on with all possible despatch. After all, it is what interests the consumer most and there does not seem to be much use in producing new and good varieties until we understand the conditions which have produced the serious deterioration of existing varieties, once so satisfactory.

EXTRACTING SISAL FIBRE.

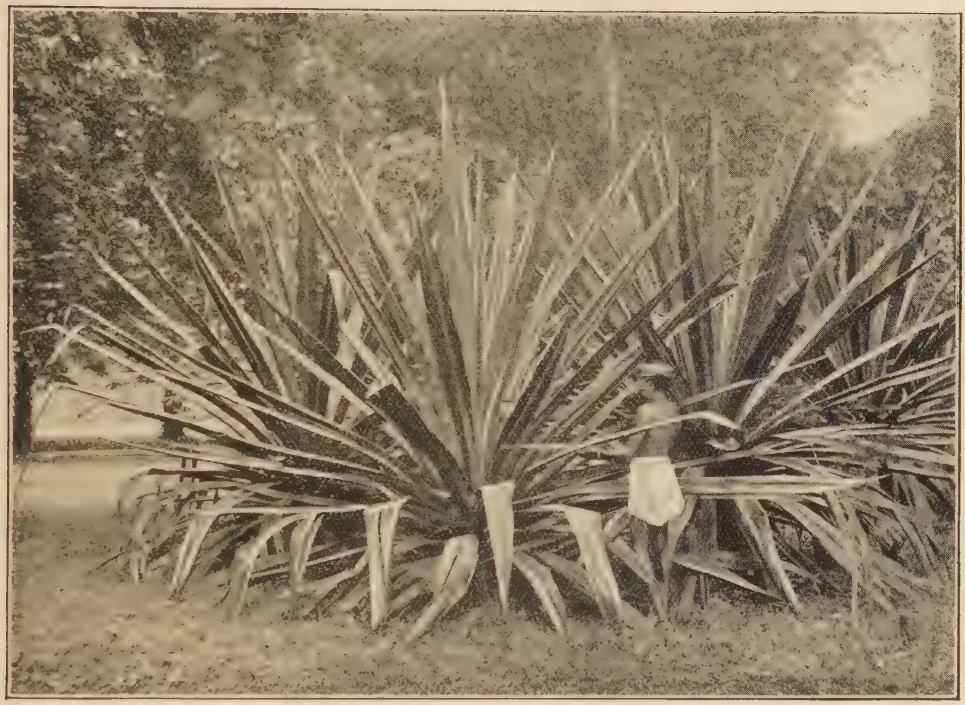
A NEW IDEA.

Owing to the great cost of sisal scutching machines, various devices have been tried to attain the desired end of extracting the fibre in marketable conditions from the leaves at a minimum of expenditure. One method was to ret the leaves in fresh or salt water, but this entailed long immersion, and proved most unsatisfactory for several reasons, one being the enormous number of leaves required to produce a ton of fibre the yield being only about 4 per cent. of fibre of the weight of leaves treated. Another objection was that the fibre extracted in salt water became harsh, dull in colour, and non-elastic, whilst that treated in fresh water while retaining its firmness and elasticity, always turned out a dirty brown colour. A third and very serious objection to fresh water retting was the pollution of rivers or lagoons by the evil-smelling refuse from the leaves.

Mr. W. H. Davidson, of Tambourine Mountain, was led to study this question of water-retting by observing, on the seaside, a complete hand of fibre which he concluded was the fibre from a sisal leaf. The action of small sand-laden waves on the beach, washing the hand to and fro, had completely removed the clinging cellular matter, leaving the fibres absolutely clean and bright, whilst Nature had fined, hardened and combined the fibres into the thorny terminal spike which is such a permanent feature of the leaves of the sisal plant. On this he remarks:—

"I fancy that the leaves, if first passed between rollers to break up the outer coating, and then subjected while fresh and soft, to the scouring action of mixed sand and water in a race with sufficient fall, or in troughs set in a series of steps, would yield a very fine quality of fibre. The leaves would need to be tethered in some manner so that the scouring action of the sand and water would give maximum results. Of course, the whole question is one of cost, but I make the suggestion for what it is worth."

(The idea is certainly novel, and possibly might be effective, but there would still be the objection of the great tonnage of leaves to be dealt with; and, in addition, it would be necessary to construct enormous races, supply many hundreds of tons of sand, and then would arise the imperative necessity for a vast permanent supply of water at the race head. This certainly might be supplied from a good waterfall, many of which exist in parts of coastal Queensland, but a fatal objection would render such a scheme impossible, owing to the pollution of the stream below the falls.—Ed. "Q.A.J.")—*The Queensland Agricultural Journal.*



MAURITIUS HEMP. (Furcrœa Gigantea). *Photo. by H. F. Macmillan.*

MAURITIUS HEMP.

The plant known as Mauritius hemp is a large succulent, stemless perennial, bearing long fleshy leaves which radiate from the base. It is known botanically as *Furcræa gigantea*, belonging to the Natural Order *Amaryllideæ*, and is a native of Tropical South America. It has been introduced into Ceylon early in the nineteenth century, and has become naturalised along the railway line up-country, where it was first planted to form a protective boundary for the railway. It was thought that it would also serve as a source of commercial fibre, but these expectations have not been realised. Experiments have shown that the leaves yield only about 1½ to 2 per cent. of fibre, as against an average of about 3 per cent. for Sisal Hemp.

The plant is sometimes confused with the latter, which belongs to the same family, but is distinguished from it by its dark green colour and by the leaves being generally spiny along the margins at the base, whereas the leaves of the Sisal Hemp are smooth-edged, comparatively rigid, and terminate in a spine. The Mauritius Hemp is readily propagated by the bulbils produced on a central "pole," as in the case of Sisal Hemp, but it does not ratoon like Sisal. The plant thrives under similar conditions as the latter, though adapted to higher elevations. The illustration shows a plot in Peradeniya Gardens, where, as will be seen, it thrives with remarkable vigour. The plant has become common in parts of India and elsewhere in the Tropics, but it has not proved a very profitable plant to cultivate. H.F.M.

COCOA.

FERMENTATION OF COCOA.

Referring to the paragraph included in our January issue regarding the publication of the above, we have now to report that the book will include the following:—

(1) Dr. Axel Preyer's Essay on the Fermentation of Cacao, which appeared in *Der Tropenpflanzer* (Berlin) in 1901.

(2) Dr. Oscar Loew's Essay (published in 1907 in the Annual Report of the Porto Rico Experimental Station) on the Fermentation of Cacao and of Coffee.

(3) Dr. Fickendey's Essay on Fermentation, from *Der Tropenpflanzer* of February, 1909.

(4) Mr. Geo. S. Hudson's and Dr. Lucius Nicholls' Joint Essay published in 1911 which won the £50 prize subscribed by the readers and friends of *Tropical Life.*

Die Kakao Fermentation by Dr Scholte (1908).

(5) Proofs of the above have been sent to four of those named above (Dr. Axel Preyer, Dr. Loew, Dr. Nicholls and Dr. Fickendey), as well as to other authorities on the subject, each of whom has kindly promised to write a short review or series of notes on all the essays, and bring them, so far as is possible, up to date. If this can de done, as we feel it will be ; then we shall have a most vuluable and unique work on the subject, one which we hope will encourage others to follow up this important matter, and carry out the experiments on a commercial scale to more final stages. Simultaneously with the English edition, we believe Messrs. J. H. de Bussy will publish one in Dutch, and the Redaction of the *Tropenpflanzer* a third edition in German, so as to enable the readers of all these languages to have the book in their own tongues, and so be enabled to study the matter first hand. Whilst the publication will be pushed forward as speedily as possible, some little delay will be unavoidable, for the various authorities have, as stated, to bring the matter up to date, and then the necessary translations have to be made and checked and the manuscript put into type and printed off. —*Tropical Life.*

SPRAYING COCOA.

BY JAMES BIRCH RORER, A.B., M.A.,

Mycologist, Board of Agriculture, Trinidad.

Although in temperate climates spraying has long since become a part of the routine work on almost every farm, orchard, and vineyard, in tropical countries fungicides and insecticides are used scarcely at all ; in fact the majority of planters have but little faith in such things, and even the mycologists and entomologists connected with the agricultural stations have made but few experiments to determine the real value of spraying in combating fungus and insect pests under tropical conditions.

From the close relationship of many of our parasitic fungi with those causing diseases of apples, grapes, potatoes and other northern crops, and the similar habits of many of our insect pests, it would seem very probable that the same means of control as are used in the North could be applied here. In order to ascertain whether or not this is true, especially with reference to the diseases and pests of cacao, a series of spraying experiments was started on several estates in Trinidad two years ago, and some of them at least have been carried through to the present.

At the same time, a scientific study of the parasitic fungi and insects of the cacao tree was undertaken. I will merely mention in passing that, of the insects, the cacao beetle and thrips were found to be the cause of the most damage (Mr. Guppy will speak of these pests in detail later on), while of the fungus troubles, the canker and black pod-rot were by all odds the most serious.

For many years much confusion and doubt existed as to the cause of these diseases and each in turn has been attributed to a number of different fungi, but it is now well proved that both are caused by the same fungus, *Phytophthora Faberi*, Maubl. Both forms of the disease are so well known to those familiar with cacao cultivation that I will not take up your time in giving detailed descriptions, but these enlarged photographs (shown) will serve to recall to your minds the exact appearance of the diseases on pods and limbs. The first picture shows the course of the rot on the larger pods. The infection takes place generally either at the tip or stem end of the pod, and the fungus spreads very rapidly until the whole fruit is involved, and in the majority of cases it runs back through the stem into the tree and there produces the characteristic canker. The rot is at first brown and later becomes black. The fruiting threads of the fungus push their way out to the surface of the pods and produce spores in enormous quantities, especially if the weather is damp.

In the stem, the fungus is almost wholly confined to the bark tissues. The disease spreads in all directions from the point of first infection, but as a rule more rapidly in a longitudinal direction. The diseased tissue at first assumes what has been called a neutral tint, but later becomes claret-coloured and often exudes a blood-red, gummy liquid, especially in the rainy season.

That both of these diseases are caused by the same fungus, *Phytophthora Faberi*, has been amply proved by inoculation experiments with pure cultures. The following series of photographs (exhibited) shows the results of some of the inoculation work, while those specimens (exhibited) which were inoculated a few days ago show that the disease has already started.

In making the experiments in the control of these diseases the following plan was followed. A block of 1,000 trees was selected and divided into two equal parts, one of which was sprayed while the other was left unsprayed as a control. The two plots were as nearly alike as possible in all respects. The trees were of the same age, and the drainage, soil and shade conditions of each were identical. Before any spraying was undertaken, a record of pods yielded by each plot was kept. Each gave practically the same number. Some preliminary work which had been done on a smaller scale showed that it was perhaps best to spray the trees when they were well covered with

young fruits. This was then done on the large plots and a second application was made from four to seven weeks after the first. Bordeaux mixture, made on the 4-4-50 and 5-5-50 formulæ, was used. At the estate pickings the pods from each plot were collected, separated, counted and sorted into sound and black cocoa. I will not trouble you with all the details of each picking on the different estates, but will merely say that the results were much the same in all.* Not only was the amount of black cacao at pricking time reduced, in some cases from 40 per cent. to 10 per cent., but a fact still more noticeable—the yield in total number of pods was greatly increased by the spraying. In the two large pickings which were generally made from four to six months after the spraying was done the yield was fully one-third more from the sprayed trees. For example, in the Sangre Grande experiment 7,010 pods were gathered from the 500 sprayed trees, while from the adjacent 500 unsprayed trees 4,805 pods were gathered. During the whole year 3,390 more pods were picked from the 500 sprayed trees.

These figures show conclusively that spraying cacao does pay. Allowing the maximum cost for labour, materials, etc., to be one cent. per tree per application, there was a net gain of over $20 from the 500 sprayed trees. Moreover, the whole benefit of the spraying cannot be readily reckoned in dollars and cents. It makes mossing unnecessary, and above all it prevents canker infection by protecting the pods ; and there is no doubt that the diseased pods are the chief source of the disease in the tree.

In taking up spraying work it must not be forgotten that it is a preventive means of control, and to be effective must be done thoroughly and in good season, before the fungus has gained entrance to the pods. Moreover, adequate machines and properly prepared mixtures must be used. In recent years many substitutes for Bordeaux mixture have been advocated and we may try a number of them here; still, the copper mixture must be regarded as the leading fungicide, and it must be properly made from dilute solutions of good bluestone and fresh temper lime to give the best results.

In conclusion, you must remember that spraying does not put the fruit on the tree, and so to be of the greatest value it must go hand in hand with good cultivation.—*West Indian Bull.*

COCOA CANKERS.

By E. ESSED, B.Sc.

I spent six months on a cacao estate in Surinam in order to study thoroughly, canker, and I wish to put the results before the members of this Conference, so that they may be able to judge of them for themselves.

A fuller description of these pegmatia than that which I gave in my paper on the Panama disease, minute details of their formation, development, germination, microchemical tests to detect their fungus origin, etc., will be given in a book that I hope to be able to publish, treating of the different diseases of cacao and sugar-cane in Surinam.

* The detailed pickings as well as methods of spraying are given in Circular No. 4, Board of Agriculture, Trinidad 1911.

† See *Annals of Botany*, Vol. XXV, 1911.

In Surinam, I never met with a tropical case of canker. I only found red streaks in wood and bark, sometimes aggregated in such a way as to become more conspicuous, and the cambial region on one side of the branch often intensely discoloured. As I was always able to grow Spicaria from, and could find pegmatia in, the affected parts, I looked upon them as incipient or abortive cases of canker. These same cases are found here in Trinidad, as I was able to ascertain. Here also I saw for the first time a typical canker, the deep claret coloured bark with the dark line of demarcation from the healthy looking surrounding tissues and the viscous, reddish exudation on the bark.

Having got the opportunity to proceed with my investigation I wish here to tender my most cordial thanks to Mr. W. G. Freeman, Assistant Director of Agriculture, Trinidad, for all the kindness extended to me. I tried first of all to find out where this viscous matter came from and what relation it bore to the disease. To be brief, I shall give an explanation, which is the result of most careful scrutiny of a large number of pathological preparations.

The cankered area arises from pegmatia formed in the intercellular spaces and cells of the bark, and imparting to it the distinctive colour. In nearly all cases the cambium underlying the cankered area is destroyed, so giving rise to a space between wood and extra-cambial tissues, partly filled with pegmation. The water brought from the vessels through the medullary rays is simply poured into the cavity, softening the pegmatium into a reddish, gelatinous mass. The softening goes on through the intercellular spaces, setting up a tension in the tissues, which results in cracking of the bark ; through these or pre-existing cracks the transfusion of the reddish viscous matter takes place. If this be so, then the red efflux on the bark is pegmatium. One might compare it with the mycocecidia-like effluxes of pegmatium on the leaves of the banana, mentioned in the paper on Panama disease. And this again being so, we ought to be able to obtain a mycelium from it ; this can actually be done. When a small fragment of dry substance is scratched off, a drop of 25 per cent. glycerine in water poured on to it, a cover-glass turned on it and pressed so as to produce a coarse powder (the substance is brittle) it will be seen after a fortnight or more that the pegmatium turns into a slimy mass with chlamydospores imbedded in it, or germinates at once, producing gemmæ in profusion. The newly-formed chlamydospores may be seen to germinate shortly after they are formed, producing short tubes on which numerous buds are developed in yeast-like fashion. (See the paper on Panama disease.) Everyone will be able to convince himself of the truth of these statements so that I may refrain from further dilating on them. But what I wish to point out and lay stress upon is that, when the discoloration of the cankered area is caused by the resting condition of a fungus formed in the cells and intercellular spaces absorbing the protoplasm, destroying the cambium and giving rise, when softened by the water pouring in through the medullary rays, to the exudation of the reddish, viscous matter on the bark, there can no room be left for the belief, that canker is caused by anything else but by the fungus to which this substance belongs, *i.e*, a Nectria or its imperfect form *Spicaria colorans.*

However, the inoculation experiments of Mr. Rorer, or rather the interpretation of his results, led him to the conclusion that canker was caused by *Phytophthora*. But in carefully reading his report, I find doubt prevailing as to whether *Phytophthora* is the real cause of canker. In the first place, serious objections could be raised against the mode of proceeding : inoculation experiments in the field, however isolated, cannot be considered to afford from a purely scientific point of view, reliable and convincing data. For, where is the criterion for the absolute health of the tree in the field ? Has Mr. Rorer tried to convince himself of the absence of any other germ in the bark, awaiting the predisposing moment Phytophthora, which will enable it to develop the symptom, which we call canker ? If he had done so, he would have explained the presence of *Spicaria colorans* in 'cracks of bark about point of inoculation' in a way quite different from that contained in the report in which he says : 'this shows how quickly the saprophytes follow.' This interpretation of the facts was wrong. It did not follow ; it was in the bark before the introduction of the Phytophthora, which was the predisposing moment for the development of a fungus, exhibiting a remarkable kind of parasitism. More of this later. I shall now give an account of my inoculation experiments, which were only carried out, so to speak, 'pour acquit de conscience.'

Seedlings were raised from selected seeds taken from pods which were thoroughly examined under the miscroscope ; sections were made of the peduncle, the husk and the placental stalk : only those pods were made use of, in the peduncle, husk and placental stalk of which no mycelium and pegmatium were found. I may here say, that out of seventeen ripe, apparently healthy pods only two could be found to satisfy the conditions. Twelve small clay pots were filled with sterilized soil and the seeds laid out, two in each pot. The pots were kept in a case, the under-part of which consisted of a concrete trough, 6 inches deep, the upper part of a wooden frame with glass panels, or sliding door giving access to the interior—a contrivance such as is used for mosquito-breeding. The trough was filled with water so as just to touch the laths which were laid across to support the pots, and with the aim of keeping the air comparatively moist, so that too frequent watering could be avoided. The water used was taken from a masonwork rain water reservoir and was always heated to boiling point and cooled down again before use. When the seedlings were fifteen weeks old and of a height of one foot and more, one in each plot, where both seeds germinated, one was cut off and sections were made and examined under the microscope. All were found to be sound. This was only a means of arriving at the greatest possible certainty as regards the perfect condition of the material.

Four seedlings were inoculated with pure cultures of *Phytophthora*, four with *Spicaria colorans* and four were left to serve as controls. Scratches were made so as to expose the whitish tissue of the bark ; bits of the pure cultures were lifted with a spatulate platinum wire, brought on to a moist bit

of sterilized cotton wool, which was then placed on the wound, carefully wrapped around the stem and kept in its place with the aid of sewing yarn, tied around the upper and lower margins. Finally bits of tin foil were wrapped around the wool, with the edges closely pressed against the stem to prevent the wool from drying too quickly.

A week after the inoculation, one of the plants inoculated with *Phytophthora* showed signs of disease : the younger leaves at the top were wilting and on one of these blotches appeared on the lower part. I removed the cotton wool and found the bark darkened around the inoculated spot. Two days after it was evident that the plant was dying : it had the aspect of chupon wilt as I later on saw it here in Trinidad. It was then cut off and examined. The bark was discoloured from about 2 cm. below the inoculation spot to the top of the little plant. The discoloured part had a very irregular, fringed outline ; the colour in the middle was brownish and along the margins like the skin of a cooked potato, a shade between grey and yellow. No trace of a cork cambium could be detected, and although in sections the hyphæ could be seen to run between the cells, the walls of the younger cells here and there collapsed, the protoplasm more or less contracted and became discoloured ; no trace of the gummy substance and reddish discoloration, so typical of canker, could be discovered. The remainder, after having been brushed and rinsed under the tap, then in distilled water and subsequently brought in a sterilized Petri dish, developed within two days the peculiar downy mycelium and long, tender conidiophores of *Phytophthora*, raised ½-inch above the medium, which was turning darker. A few days after, the conidia were shed and the material was perfectly black and rotten. The bandages of the other seedlings, inoculated with *Phytophthora*, were removed on the tenth day ; they did not show any other external sign of disease but the darkening of the bark around the inoculation spot. In examining them more closely they were found to exhibit the same changes as were cited for the first, but the area affected was considerably smaller, and there was no reason to think that they would die. The bandages of the seedlings, inoculated with Spicaria, were taken off on the fourteenth day ; there was no sign of disease, no change of the bark visible on the surface, and matters remained so until the end of a month, when one was cut off, of which sections were made. Then, it was found that the inoculation had taken effect ; the hyphæ were preparing themselves a way through the inter-cellular spaces, and a single pegmatium had formed here and there. From the remaining portion pure cultures of Spicaria could again be raised. The controls were all perfectly healthy.

Canker is caused by *Spicaria colorans*, or rather the Nectria to which Spicaria belongs, but only when its development is facilitated by a predisposing moment, which may be : (1) excessive moisture as Mr. van Hall

assumed—and this appears to have been the predisposing moment, in Surinam ; (2) Phytophthora, as was shown by Mr. Rorer's experiments ; (3) any other factor, which is the cause of a reduction of the vitality of the plant.

The parasitism of the Nectrias has now to be considered. The Nectrias —perhaps I ought to say the pegmatium-producing Nectrias—display all gradations between extreme saprophytism and extreme parasitism. We all know how well they thrive on dead matter, demonstrating their extreme saprophytic character ; but it is less known that they may grow in living tissue without doing any harm at first : a kind of symbiosis, which is the transition of saprophytism to parasitism. But gradually the greedy messmate may adopt rapacious habits, so slightly interfering with the nutrition of its fellow symbiont ; it becomes an isotrophyte. It may go on little further, more and more encroaching upon its friend, which is made a victim, and here the increased influence on the assimilation of the host may lead either to the suppression of growth or to the stimulation of abnormal growth : it turns into an atrophyte or a hypertrophyte. In the end it may exhibit kteinophytic habits, killing the entire host-plant.

The results of my inoculation experiments go far to show that *Spicaria colorans*, which is simply a conidium stage of a Nectria, could grow in the tissues, without causing any real damage : that is, it could be a symbiont. The cases of incipient or abortive canker, mentioned before, demonstrate the stage in which it slightly interferes with the assimilation of the cacao tree; being then an isotrophyte, the canker stage shows that it could be an atrophyte and hypertrophyte at the same time, the cankered area being the atrophied part and the wound cork, surrounding the cankered area, being due to hypertrophy. Finally, the tree dying after being ringed by canker, presents us with the picture of the kteinophytic habit of the Nectria. More instances of this pleomorphic parasitism may be cited, such as the 'little leaf disease' of the coconut tree, which is simply the atrophic condition of the disease of which the root rot of the same plant is the kteinophytic condition. It is to be concluded that the coconut diseases in this island are caused by a Nectria ; the discoloration of the tissues is due to the formation of pegmatia in them, and the death of the tree to these pegmatia seriously interfering with the assimilation and water transport in the plant ; the latter condition causes the withering of the leaves from the tips downwards and their falling back against the stem. Indeed, it is the very image of the Panama disease, and it is not unlikely that the disease is caused by the same Nectria. Mr. Stockdale found a Fusarium in his cultures, and this was to be expected ; the Fusarium belongs to the Nectria, it certainly arose from the pegmatia, probably preceded by Cephalosporium. Mr. Rorer thinks the disease may be due to bad soil conditions ; this also may be right, because the Nectria would not attack the coconut tree, if its vitality was unimpaired. So beware of the Nectrias.—*West India Bull.*

GENERAL.

A NEW TIMBER PLANTATION AND MINING ENTERPRISE IN INDIA.

It has long been evident that there are in India vast commercial possibilities as yet undeveloped, and with the present activity of trade in this country it is natural that attention should be turned to new fields for wealth awaiting investment. For a considerable time the political agitation in India has obscured to a large extent her industrial potentialities, but the Imperial Government as well as the ruling Princes are awaking to the advantages of the commercial developments of the country along reasonable and properly established lines. The official world of India has very properly given no encouragement to schemes unless they have been calculated to promote confidence in the commercial future of the country.

Under the title of the Eastern Development Corporation, a new company formed for the purpose of developing a number of the industrial possibilities of India, will shortly issue its prospectus. The undertaking will have an authorised capital of £250,000, and will acquire and work certain concessions, in addition to promoting separate companies to work several of the projects. The Board comprises some well-known names, including Sir Richard Carnac Temple (Chairman), Sir George Doughty, M.P., Sir Henry C. King and Messrs. Kenneth R. Balfour, J. S. Browne, Horace Drummond Deane-Drummond, J. W. Hornsby, J. E. Needham, and F. E. Rosher (Managing Director.)

The corporation acquires its several properties, concessions and prospecting rights from the Eastern Syndicate, which was formed for the investigation of various enterprises in India. With the co-operation and assistance of a number of well-known residents in India, the syndicate, it is claimed, has built up a valuable and extensive connection, and has secured properties and concessions which justify the formation of a powerful corporation for their development. These include timber rights, the collection of vegetable tallow, coconut plantations, rubber and tea plantations and the working of gold-bearing areas and diamond concessions. The various branches have been respectively reported on by Mr. P. Bosworth Smith, the well-known geologist and mining engineer ; Mr. Henry Pilkington, late inspector of coffee estates to the Government of Mysore ; Mr. L. H. Neave, mining engineer ; and Mr. J. Vincent Taaffe, hardwood expert ; each in his own department. It is proposed to proceed at once with the formation of separate companies to work a number of the projects. Three flotations have been arranged, from which a profit approaching £100,000 is expected. In addition, a regular and substantial revenue is anticipated from the working of the timber and vegetable tallow concessions.

VARIED ACTIVITIES.

The timber rights referred to give the company the monopoly to fell and remove the walnut and other broad-leaf trees in the Government reserved areas of the Hazara Forests. As regards vegetable tallow, the company has leases from the Government of Madras and the District Board of South Canara giving the exclusive right to collect fruit from the Dhupa trees in these districts. A vegetable tallow is extracted from this fruit, and samples have been submitted to certain large soap manufacturers in England, who have expressed their willingness to take the whole out-put at a satisfactory price. The net revenue from this source is estimated at £24,000 per annum and from the timber concessions £14,000 in the first year, if only 500 trees are handled. Contracts have been made to purchase two coconut estates in Ceylon, comprising 1,166 acres, and an option to purchase a further estate of 1,250 acres in Kelantan, Malay Peninsula. There are also options to purchase 242 square miles of land in Madura district, South India, containing timber, forests and land for plantations, rubber and tea estates of 823 acres in Mysore, mining leases and prospecting licenses over eight square miles in Mysore, and diamond concessions over 1,400 acres in the Kurnool and Anantapur districts.

As the corporation points out, there are many Indian industries undeveloped or neglected which are capable of great commercial results. To take the goldmining industry, long before the era of commercial records, gold was mined in Mysore, and then the mines were shut down and even the whereabouts of most of them forgotten. The well-known Kolar goldfields in thirty years have raised gold to the value of 35 millions sterling, but they have been the chief source of supply in India within the memory of the present generation. It has now been found by investigations, however, that other parts of Mysore offer great possibilities. For many centuries India supplied the world with diamonds, yet it would seem that half the deposits notably in Madras, remain untouched. In the Madras Presidency, of course, are the old Golconda mines, which have produced the Koh-i-noor and so many other famous gems. In its less romantic and more peculiarly mercantile resources India offers a series of almost untouched fields. The timber capacities of the North-West Frontier impress even those who are familiar with the virgin forests of the newer world. In the Government reserved areas of the Hazara forests alone official statistics show that there are 16,000 walnut trees. The burrs of these yield a highly valuable veneer, which brings a high price in the European market. The main sources are at present in Persia and Asia Minor, and these are becoming exhausted. The possibilities of the supply from the North-West Frontier are, therefore, all the greater commercially. Among the other points to which recent investigation has drawn attention is the use of the Dhupa tree in the commercial development of India. The vegetable tallow, which the tree produces, is held to be indispensable to the manufacture of soap and candles, and just as it is asserted that the walnut tree of the Hazara forests of the North-West can be disposed of at a profit of £28 per tree, so it is asserted that the use of the Dhupa can be made to yield a profit almost equally satisfactory in relation to the expenditure involved.—*The Indian Agriculturist.*

INDIGO IN MADRAS.

BARON SCHROTTKY'S SUGGESTION.

Baron Schrottky de Schrottzynski, in the course of a letter to the Honorary Secretaries, Central Agricultural Committee, Madras, writes:—

I know of no reason why the cultivation of *Indigofera arrecta* should not be successful in Madras, if the experience acquired elsewhere is fully taken advantage of. It took fully four years before planters in Behar learnt how best to grow this indigo, but the experience gained there has enabled its successful introduction into the dry Districts of Gorakhpur, into Ceylon and Singapore. It is a hardier plant than either *Indigofera tinctoria* or *Sumatrana*, excepting in the very earliest stages of its growth, and it withstands long periods of drought better than either of these latter. Your District Associations should take the matter in hand and grow an acre or so in every one of the Madras indigo districts. It must be a surface sowing, and December-January would be a good time for sowing.

I am, however, of opinion that, even with the cultivation of the ordinary varieties of indigo, especially of the Nandyal plant, there is every prospect of indigo manufacture in Madras becoming once more a profitable undertaking, if better methods of manufacture are adopted and the dye marketed in the form of a paste. Factories are still in existence, and the labour and supervising native staff have not yet forgotten what they learnt from their fathers. The ryots would gladly resume indigo cultivation, if they could get for their crop again what was paid in 1894, for they have learnt to appreciate the great manurial value of the *seet*, or indigo refuse. Your Committee, doubtless, appreciates the great benefit which would result from a successful revival of the indigo industry in Madras, and from raising indigo cultivation from 60,000 acres, at which it is now, again to over 500,000 acres, which it was 18 years ago. With the new methods of manufacture a return of dye, of the gross value of Rs. 120 per acre, can be obtained, while the manurial value of the residue, the *seet*, obtained from an acre under indigo, cannot be put down at less than Rs. 90. Indigo can therefore become once more a valuable crop; it is a plant which does not exhaust the soil, for it draws its nourishment from strata not reached by ordinary crops, it requires no manure and is one of the plants which enrich the soil, a fact that is well-known.

Indigo harvest and manufacture give employment to agricultural labour at a time when there is little demand for it for other crops, and for all these reasons there is no other staple product that has as much to recommend it.

I need not refer at any length to the causes which have reduced the cultivation of the indigo plant in Madras from 500,000 to 60,000 acres. They are well-known. The competition of a synthetic dye has reduced prices to a level at which it does not pay to produce natural indigo on the old basis. One hundred and twenty bundles of green plant (each bundle weighing 100-120 lbs.), or say 12,000 lbs. can be produced in two cuttings from an acre of land in Madras. This fills a steeping vat of 1,000 cubic feet content, and the outturn therefrom is, on an average, 25 lbs. of indigo costing Rs. 25 to manufacture, and selling at about Rs. 25 to Rs. 32, according to quality. The margin of profit to the manufacturer is therefore very small under the best circumstances, and but for the great value of the *seet*, no indigo at all would be grown in Madras. With new methods of manufacture and marketing the dye as a paste, very different results can be obtained. The outturn in Ceylon from 100 lbs. green plant has been 3 lbs. of a 20 per cent. standard indigo paste, the value of the paste being As. 8 per lb. Estimating the outturn in Madras at only 2 lbs. of standard paste per 100 lbs. green plant, the outturn from 12,000 lbs. plant can safely be taken at not less than 240 lbs. of standard paste, value Rs. 120.—*The Indian Agriculturist*.

CEYLON PLANTING INDUSTRIES.

EXPORTS IN 1912.

					Rs.
Coconut Oil	...	Cwts.	527,504	Value	3,741,479
Copra	...	,,	623,934	,,	10,479,288
D. C. Nuts	...	,,	264,198	,,	6,276,464
Coir Fibre	...	,,	188,500	,,	1,786,980
Fresh Nuts	...	,,	18,829,366	,,	1,431,140
Coir Yarn	...	,,	116,411	,,	1,173,423
Poonac	...	,,	249,262	,,	1,024,638
Coir Rope	...	,,	19,327	,,	193,270
Coconut Shells	...	,,	900	,,	28,278
Coir Matting	...	pkgs.	280	,,	5,110
				Total Rs.	36,040,070

Plumbago	...	Cwts.	577,270	Value	7,446,783
Arecanuts	...	,,	135,729	,,	2,765,551
Citronella Oil	...	lbs.	1,545,097	,,	1,070,048
				Total Rs.	11,282,382

Cinnamon Spices Plants		Cwts.	54,826	Value	3,070,256
Cinnamon Oil	...	ozs.	90,710	,,	24,273
do leaf Oil	...	,,	76,008	,,	7,798
Tobacco (unmanufactured)		lbs.	3,703,568	,,	820,122
do (manufactured)		,,	2,112	,,	2,347
Cotton (Kapok and Spinning)		,,	270,318	,,	67,136
Pepper, Spices etc.	...	,,	2,424	,,	73,625
				Total Rs.	4,065,557

Grand Total Rs. 51,388,009.

Compiled by the Hon. Secy., L.C.P.A.

AREAS UNDER CULTIVATION 1912.

Low-country Products.		Acres.	Up-country Products.		Acres.
Coconuts	...	942,621	Tea	...	580,841
Paddy	...	680,574	Cocoa	...	43,358
Cinnamon	...	47,292	Coffee	...	1,512
Other Grain	...	101,708	Cinchona	...	263
Citronella	...	40,000	Cardamoms	...	3,112
Arecanuts	...	52,000	Rubber 186,634 Acres		
Tobacco (Jaffna)	...	16,241			
Cotton	...	767			
Pepper, Spices	...	3,647			

Compiled by the Hon. Secy., L.C.P.A

CEYLON COCONUT INDUSTRY.

Extracts taken from the Report of the Low-country Products Association for 1912:—

TRADE PRODUCTS OF THE COCONUT PALM.

	Copra. Cwts.	Coconut oil Cwts	Desiccated Nut lbs	Poonac. Cwts.	Coconut. No.
1912	628,529	395,740	31,295,813	169,019	15,983,749
1911	782,034	495,466	32,604,546	207,527	15,269,723
1910	766,906	616,377	27,201,074	309,589	16,114,088
1902	512,498	374,996	16,227,565	247,697	12,588,212
1901	439,865	453,531	14,055,493	204,356	14,850,781

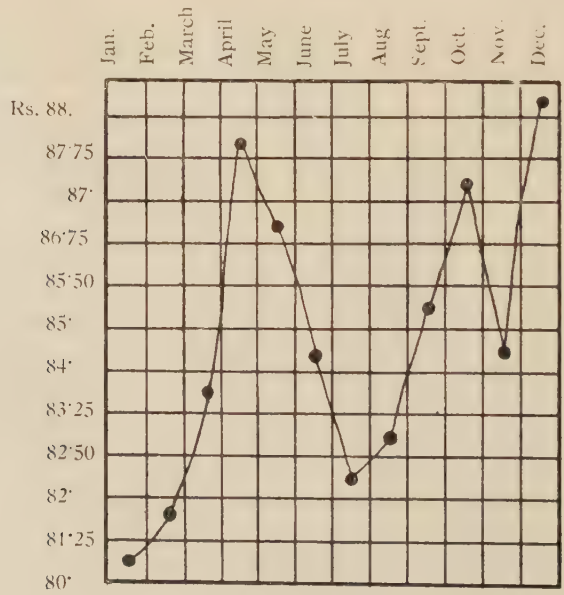
The above table will enable members to compare the advance of the trade with the two previous years and with the figures of a decade previous, Assuming for argument that the local consumption in nuts was very much more for edible and other purposes in 1912 than in 1902, the advance in quantity of the principal exports is not sufficiently encouraging. The crops of 1912 were nearly 33% shorter owing to the drought of the two previous years,

But per contra the large acreage of young plantations yearly coming into bearing will have to be taken into account. How comes it then that with all the progress in coconut planting which has gone on during the last decade, stimulated as it has been by higher price, the exports are not advancing? The only explanation that can be offered is that old plantations are yielding poor returns and therefore the increased yield from young plantations is only able to maintain the balance. It must be acknowledged with satisfaction that in several estates improved methods of cultivation have recently been adopted, but this holds good only in one or two districts. Your Committe would therefore urge all interested in the cultivation of the palm that a more general adoption of intensive cultivation would be necessary of all the estates that have reached the bearing stage if the present position which Ceylon has hitherto enjoyed as the leading coconut exporting country in the world is to be maintained. Scientific manuring and intensive cultivation demand, however, intelligent supervision in the management of the plantations. The growing demand for such managers lends an additional reason for the early equipment of a College of Tropical Agriculture in the Colony.

The loss in crops has been compensated by the steady prices maintained for all the produce of the Coconut palm in 1912 as compared with 1909—The average price for Copra in 1909 was 66.40 while in 1912 it reached 88.50.

COPRA.

In January the price of Copra opened out with Rs. 80 and when the year closed the price was Rs. 88/- The table below will show how the prices varied:—



The quantity exported during the period under review fell short of that in 1911, which held the record by 53503 cwts. or 10,700 candies.

Much has been written and said on the question of copra drying in Ceylon and the market reputation of Ceylon copra being inferior to that of Cochin, the latter obtaining £2 per ton more than the former. The local method of copra drying now in vogue produces a large proportion of poor quality copra, but what becomes of white copra that comes from Kalpentyn, Batticaloa, Jaffna and some of the well known estates in Puttalam and Chilaw? What of the white Oil from Ceylon ? Are all these sold as Ceylon or Cochin in foreign markets ? Your Committee feel that the Association should endeavour during the current year by co-operation with estate proprietors and exporters of Copra and Oil to create a standard for Ceylon White Copra and Ceylon White Oil. The two or three rupees over the market price of ordinary quality per candy will be sufficient encouragement for producing better quality and also establishing for Ceylon a reputation that Copra and Oil as good as Cochin can be produced and supplied in Ceylon. Estate owners will then feel the necessity to introduce more efficient methods of drying and preparation of Copra.

COCONUT OIL.

The export in this article was nearly 100,000 cwts. shorter than in the previous year and 220,637 cwts. below the export in the record year 1910. The value for 1912 is given as Rs. 10,586,876.

In India the average annual export for three years has been 200,000 cwts or 2,500,000 gallons of the value of Rs. 3,750,000 according to the Agricultural Ledger for 1911/12 and represent the output of the Malabar Coast and Cochin. It will thus be noted that the Ceylon export is three times as great, and your Committee feels that the remarks above relating to preparation of white Copra and Oil have greater significance and deserve early attention.

DESICCATED COCONUT.

The price of the above article at the beginning of 1912 was 22c per lb, but towards the middle of January it rose to 23c. and this price remained for goods to be delivered up to end of March. From that time onwards, Desiccated Coconut for April-May delivery was sold at lower rates, and the price was about 22½c. For May-June delivery the price was again higher, and transactions were put through between 22½c. and 23¾c. In June the price was slightly lower and transactions took place for delivery in June, July-August at the prices of 22c. and 22¼c. At the beginning of July 22¾c. was paid and at the end of July the price was only 21c. and in August only 20¾c. was obtainable, whereas towards the middle of August the price was as low as 19¾. On the 20th August again the price went up to 22c and in September fell to 20¾c. to 21c. a lb. During the previous years in September-October it was usual for prices to rise and the millers also seemed to have expected a rise in value in October 1912 and were therefore manufacturing more stuff than they usually did. However, owing to the war in the Balkans and the general restrictions to the trade that took place at that time of the year the expected did not happen. Large stocks only realised lower rates, and prices went down to 20½c. about the middle of November and at the beginning of December several thousand cases were sold at prices from 19½c. to 19¾c. For some lots even 19c. was paid per lb. After that

and till the end of the year prices were between 19¾c. and 20½c. per lb. The shipments from Ceylon during 1912 have been short by nearly 1½ million lbs. as compared with 1911.

So far Ceylon has been the only coconut producing country in the East where Desiccated Coconut was manufactured. It is however stated that in Java, Sumatra and other Islands in the East Indies, Desiccating Manufactories are being erected. It remains to be seen whether they will be able successfully to compete with Ceylon.

Desiccated Coconut has also been manufactured for a few years in the United States of America, but, so far, their manufacture has not influenced our market, as the Ceylon quality maintains a high reputation and is easily sold. The Nuts of Ceylon seem to be more suitable for desiccating than the Coconuts grown elsewhere.

POONAC.

This bye-product of Oil-crushing usually keeps pace with the oil exports and during the year under review the export fell short by nearly 40,000 cwts which is quite proportionate with the fall in oil. Chekku poonac is largely utilised locally for feeding draught cattle, milch cows and pigs. The continued high price in the commodity has made the food impractical with owners of cattle.

The *Journal of the Board of Agriculture* in England for October 1912 gives a short account of the investigation to determine the suitability of coconut cake or poonac as a food for the production of milk and butter. Although the poonac produced little effect on the yield and quality of the milk, it was clear that this food made the butter much firmer and it is suggested that on this account it should prove useful as a food in warm weather when difficulty is experienced in making firm butter. All dairy enthusiasts in Ceylon will do well to take advantage of this information.

Nuts in shells, besides fibre, was the only product that exceeded the previous year's export. Below are comparative tables of yarn and fibre comparing the last three years with that of 1902—a decade previous. The trade in fibre was excellent throughout the year.

Fibre Mills and Desiccated Coconut Mills have been established locally with marvellous rapidity during the last two years, the Desiccating Mills in the Western Province being about 22 while Fibre Mills in North Western Province and Western Province total about 50.

	Coir Fibre	Coir Yarn
1912	234,565	103,862
1911	195,777	115,528
1910	176,410	108,775
1902	116,000	77,157

The great demand for husks to keep mills employed resulted in a greater scarcity of yarn and the local prices for yarn went up 20% during the year. Even the export has fallen off by 8,000 cwts. or 8% of last year's total export. The export of Fibre has more than doubled itself in 10 years and reach the record of over 11,700 tons.

The other articles manufactured from the Coconut Palm do not claim any special attention.

FARM COMPETITIONS IN AUSTRALIA.

Mr. Temple A. J. Smith in concluding his article on the Nhill Farm Competitions states:—I should like to say that the opportunity given me of such a comprehensive run round the district has been very highly appreciated and the quality of the land seen and general resources have left a deep impression of its value, both present and prospective. At the same time I should like to suggest that more attention towards the maintenance of the soils' productiveness should be taken than is apparently the case. The constant cropping with one or two kinds of crop only must tend to use up the available plant roots in undue proportion, and a system of rotation such as that spoken of would do much towards this end. This has been the experience in all the older countries of the world, and must follow here in due course. Prevention is better than cure in this respect and the sooner steps are taken to bring about better systems, the less danger there will be of trouble. A striking example of the effect of farmyard manure, in which the humus supplied is probably of the greatest value, was seen at Mr. G. Crouch's, where a patch of wheat stood out above all his other crops where the land had been treated to a top dressing of this class of manure. That there are old-established farmers in the district who are fully alive to these matters is beyond doubt, and it is very satisfactory to find that there are young men equally keen, with plenty of grit, coming on.

On the border of the great desert one case was met where a boy of fifteen had put in and grown a very nice crop of wheat, and showed the greatest interest in his work, and a desire for information that would lead to better prospects.

Another case of a young man who had come away from home and tackled the land, rather against his family's wish, and was making a success of farming, while, in yet another case, a man who was working for wages twenty years ago now had some 2,500 acres of land, worth £5 per acre, 600 acres of which were under wheat and oats, 500 sheep and all the necessary appliances for conducting his farm operations.

These were cases that came under notice, and there are probably many others. All this goes to prove that not only is the land good, but there are some of the right men on it. The freedom with which all topics were discussed in connection with farming pursuits was particularly pleasing, and the genuine hospitality shown greatly appreciated.

I should also like to take this opportunity of thanking those gentlemen who so kindly and generously lent their cars to expedite the work of judging, without which the time occupied would have been much greater and the work more arduous.

Mr. Towns, the Secretary, accompanied the judge on all occasions, and the Society is to be congratulated upon having the services of a man so thoroughly interested in its welfare and success of these competitions, which are evidently having beneficial effects on the farms and farmers of Nhill —*Journal of Agriculture, Victoria.*

PROGRESS IN AGRICULTURAL EDUCATION.

The Board of Agriculture and Fisheries has issued its annual report on the distribution of grants for agricultural education and research in the year 1911-12 (Cd. 6601). Bound up with the report are statements respecting the several colleges aided, and a summary of the agricultural instruction provided by county councils in 1910-11. It may be convenient to give a list of the groups of workers who will in future be provided for the purpose of aiding the farmer to increase the productiveness of land.

Group I. Scientific workers engaged in research and the extension of knowledge in national research institutes devoted to the study of different sections of agricultural science without reference to the needs of particular localities.

Group II. Scientific workers engaged in consultative work with a view to the application of the results of research to practice. These workers will be stationed at collegiate centres serving groups of counties; as distinguished from workers in Group I., they will make a special study of the needs of particular localities.

Group III. Teachers engaged in the diffusion of knowledge; of these the following sub-groups may be distinguished:—

(a) Lecturers in universities and colleges instructing pupils whose age, previous education, and circumstances enable them to attend college courses.

(b) Teachers employed at farm schools in instructing pupils who for various reasons would not benefit from, or could not attend college courses.

(c) Instructors employed in peripatetic work teaching those who, because of their age and circumstances, cannot study in schools or colleges.

The work of persons employed in the different groups may overlap the worker in a research institute may often be asked for advice, a college teacher may frequently be called upon to give extension lectures, and at certain seasons of the year the peripatetic instructor may be required to teach in a farm scho l; but in the main the work of the different groups is distinct, and now that increased funds are available it is to be hoped that the authorities responsible for selecting those employed under agricultural education schemes will recognise more fully than heretofore the need for a division of labour. The "all-round" agricultural expert is no longer much required, except for the general supervision of local work; to be really useful either to the large farmer or the small-holder the teacher must be a specialist; if he is a scientific man his attainments in some branch should be high; if a practical man he must be a more skilful practitioner than the majority of those whom he instructs.—*Nature.*

THE NEW ORDER OF THE BRITISH BOARD OF AGRICULTURE.

The new Order issued by the Board of Agriculture and Fisheries regarding the slaughter of tuberculous animals is of the first importance as affecting the public health. The Order will come into operation in May. In an explanatory circular the Board announces that they had obtained from the Treasury authority to refund the local authorities half the net amount payable by way of compensation for animals slaughtered during a period of five years from the coming into operation of the Order. It is gratifying to be able to record that in this matter the State is at last recognizing its responsibility to agriculturists for payment of a reasonable compensation for animals slaughtered in the public interest. It is not surprising, nevertheless, that the Departmental authorities go on to state that the liability of the Government and of local administrative authorities to provide compensation from public funds is a serious one, and cannot be continued unless experience shows that a return commensurate with the burden imposed is being obtained.—*The Veterinary News.*

Manihot Plantation Rubber.

We take the following from the yearly report of a leading London Broker firm:

Manihot Crêpe is now a most important grade and the outputs of the various estates are rapidly increasing.—The quality too, shows great improvement and consequently the prices paid throughout the year are, we consider, most satisfactory.—This rubber has proved very useful for a great many purposes, being extremely tough."

This report is very encouraging and we beg to add to it, that Manihot Plantations can be arranged from normal tropical conditions to excessive dry climates in elevations ranging up to 6000 feet. Manihot Glaziovii does well in regions with more or less normal rainfall; whereas Manihot Dichotoma and Manihot Pianiensis prefer heat and drought and will grow under conditions unfit to bear any other, being about five times as many trees to the acre, than Hevea, thereby reducing the cost of investment and of labour (planting, weeding, tapping etc. considerably:—

Yours Truly,

GEVEKOHT & WEDEKIND.

PHASEOLUS LUNATUS BEANS.

Tangakellie, Lindula. 24th February.

To the Editor of the "Tropical Agriculturist."

Dear Sir,

I should like to attract your attention to the article on "Beans" in the *Imperial Institute Bulletin* of December last suggesting that, if you know the dangerous variety does exist or thrive with us, you might perhaps think it worth while warning us generally of the appearance of the variety to be avoided.

Yours faithfully,

H. E. WALKER.

[Steps are being taken to obtain samples of the different varieties of the *Phaseolus Lunatus* beans grown in the Island with a view to their identification and examination to ascertain their suitability or otherwise as human food.—Ed. *T. A.*]

DR. WILLIS ON THE RIO CLIMATE.

To the Editor of the "Tropical Agriculturist."

Dear Sir,

Many letters come to me from Ceylon, asking for seeds of this or that cultivation pursued near Rio. People do not realise the great difference that exists between the climates, and a few words about that of southern tropical Brazil may be useful.

The mean temperatures of the different months in Rio and rainfall are:-

	Temp:	Rainfall		Temp:	Rainfall,
Summer	o	in.	Winter	o	in
Jan.	77	6	July	65	1½
Feb.	78	4	Aug.	69	2
Mar.	77	5	Sep.	69	3
Autumn			Spring		
Apr.	74	4	Oct.	71	3½
May.	71	3	Nov.	73	4
June	68	2½	Dec.	76	6
			Total rainfall ...		45

Mean temp: of the year 73° (=Badulla). Rain 45 in. (=Jaffna).

With so small a rainfall, Ceylon experience, especially as the soil here is identically the same, would lead one to expect a dry country like the North-Central Province. But, in fact, Rio looks *more* green and "tropical" than any place in Ceylon except one or two spots in the South-west. The rain is equally

distributed and is generally gentle rain, as in England, not furious rain, as in Ceylon (*perhaps* due to the fact that large areas are preserved in forests near Rio). Though the fall is small in winter, the sun is correspondingly weak, feeling like an English April or May sun, and the evaporation therefore is small. I have never seen any tint of brown on the grass here, like one sees it in Ceylon in February or March. Even in the hottest weather, as at present, the temperature shown by the black-bulb thermometer in vacuo is rarely over 50° C (122° F.) against much higher temperatures in Ceylon The topee is never seen here except on English passengers,and is known in consequence as *chapeu inglez*, being supposed to be a local hat in use in England among the lower classes. During the cold weather, though it is not absolutely so cold, by thermometer readings, as Nuwara Eliya, it feels much colder, owing to the absence of a fiery sun, and one sees lots of ladies (including English) going about in fur stoles and wrappers, the cars and taxis being all open. An average cold weather day has a maximum of about 65—70°; a minimum of 60—63°.

Inland from Rio the whole of southern Brazil is a plateau with an average elevation of 2,000—3,000 feet, looking not unlike the Uva country from Welimada to Wilson's Bungalow and with ranges of mountains through, it, the highest summit reaching 9,470 feet. Until the second range of hills is passed this country has rain all the year round. Beyond is the "Campos" with rainy summer and dry winter. Most cultivation is in the wetter parts, *e. g.* coffee about S. Paulo and North of it. But the climate is much more like that of Southern Europe than like Ceylon: in Sao Paulo the trees used for shade in the streets are *planes*; and apples, strawberries, pears. etc., are commercial crops Up-country. Even in Rio, while we can grow Hevea rubber and any other tropical things, we grow great shows of European flowers and even a few fruits. In my private garden I have had for the last six months a lovely show of snapdragons, pansies, carnations, pinks, roses, azaleas, cockscombs, gladiolus, and many other things besides shoeflower, gardenia, canna, mango, jak, and other tropical things. Up-country, where it is 10° colder, the gardens look like those of southern Italy, or California.

Though we are in the latitude (S) of Calcutta (N) of Hongkong, the climate here is totally different, being much cooler and damper. White children (of European parentage) are not supposed to stay in Calcutta beyond three years old; here they often stay to 15. Rio has many thousands of English and American residents, and it is almost as common as not to find among the older of these one who has not left the place for 20, 30, or even more years. During the last 15 years it has been thoroughly sanitated, so that yellow fever is unkown, malaria almost banished and the death rate reduced to 19. Mosquitoes are kept down by a (paid) mosquito brigade that perpetually overhauls houses and compounds, destroying breeding places. No pond is allowed without fish in it.

Yours faithfully

John C. Willis,

Director of the Botanic Gardens.

Ro de Janeiro, 14th January, 1913.

VISITORS TO KEW.

3,815,427 persons visited Kew during 1912, probably a record attendance for any garden. In April 670,081 visitors passed through the gates.

INTENSIVE FARMING IN THE COTTON BELT OF AMERICA.

Farmers generally recognize the value of organic matter in the soil. It is rare, though, to find a man who utilizes this means of increasing crop yields to as great an extent as he profitably might. Most run-down farms of the country, particularly in the South, are in far greater need of organic matter to make them productive than they are of commercial fertilizers. In the South many means of adding organic matter to the soil are neglected. Weeds, cornstalks, cotton stalks, straw, stubble, and other trash are generally burned before the land is ploughed. This is a fundamental error. They should be ploughed under or worked into the soil, and in addition to this certain crops should be planted for the express purpose of green manuring. By this means alone, yields on poor land may frequently be trebled or quadrupled.

Several bulletins have already been issued by the Department of Agriculture showing the different methods of maintaining crop yields. The present bulletin gives the results of a study of the system followed on a one-horse farm by an Alabama farmer who practised intensive farming with field crops and increased the producing capacity of his soil more than tenfold, principally by making it rich in organic matter, without the extensive use of either manure or commercial fertilizer. The results obtained would not be so surprising had they been secured in trucking or some other highly specialized kind of farming.

When a man who is located in a section where much of the land has been abandoned by the so-called better class of farmers is able to make a comfortable living from only 2 acres of the ordinary field crops of the South and a small garden with the use of but little manure and practically no commercial fertilizer, the methods by which this is done ought to be of value to every farmer interested in increasing the crop-producing capacity of his land.

CONCLUSION.

The noteworthy fact in this account is that productiveness as measured by cotton was increased from one-third of a bale to 3 bales or more to the acre by the simple processes of seed selection and the addition of organic matter to the soil.

While some of the methods employed on this small farm would not be practicable on farms of a greater area, the principle involved is applicable in a general way to practically every farm in the Southern States and is fundamental to permanent agriculture everywhere. The greatest need of nearly all southern soil is more organic matter, and this fact was recognised by McCall when he began work on his 2 acres. On farms of more extensive

area it would not be possible, even were it practicable, to secure decayed leaves and other vegetable matter in large quantities for ploughing under, as was done in the earlier part of the development of this farm, but the same results can be attained by other means. In the Southern States this can be accomplished by growing winter cover crops, such as crimson clover, but clover and hairy vetch either alone or with winter cereals. Many of the other features, however, such as saving and utilizing all the animal manure produced on the farm, ploughing under rather than burning all the corn and cotton stalks, weeds, and other vegetable matter, and increasing the depth of soil, can be put in practice on any farm.

The introduction of some such winter legume as hairy vetch, bur clover, or crimson clover with the oats would no doubt have helped to increase the organic content of the soil and to hasten the building-up process, but even without these, results have been secured which may be ranked as exceptionally good on even our best farms, where fertilizers, manures, and legumes are all used.—*Farmers' Bulletin.*

RECORD TEMPERATURE AT PERADENIYA.

A temperature of 91·5° F. in the shade was registered at Peradeniya on March 12th, and on March 13th a minimum of 51·5° F., a range of 40 degrees. This is the lowest temperature and greatest range recorded for many years.

COMMITTEE OF AGRICULTURAL EXPERIMENTS.

Minutes of a meeting of the Committee of Agricultural Experiments held at the Experiment Station, Peradeniya, at 3 p. m. on March 13, 1913.

Present:—The Director of Agriculture (in the chair), the Government Mycologist, Messrs. A. Bruce, F. H. Layard, N. W. Davies, G. H. Golledge, W. Coombe, H. D. Garrick, R. G. Coombe, M. L. Wilkins, J. D. Vanderstraaten, the Superintendent, Experiment Station, Peradeniya, Secretary; and Messrs. J. Fraser, H. A. Beachcroft, John Still and J. A. Campbell as Visitors.

Papers Tabled:—The Progress Report of the Peradeniya Experiment Station, and the monthly statement of Accounts.

Minutes of the previous meeting of the 9th January last were read and confirmed.

The Chairman made reference to the proposed trial grounds and said that it was proposed to have 3 trial grounds instead of two. The trials would be at first confined to growing trees and the planting of coconuts will be undertaken later on. A plot of 24 acres of bearing coconuts had been offered by Mr. N. J. Martin of Chilaw and application would be made to reserve a piece of Crown forest land near Chilaw for planting experiments.

Mr. F. Beven had offered 25 acres of young coconuts at Veyangoda. At a conference held at the Galle Kachcheri on the 7th, a number of land-owners offered coconut plantations for a trial ground. Mr. Harbord will proceed there to select 2 or 3 of the most suitable and a final section of them will then be made by the Director.

The Chairman read the correspondence between himself, the Chamber of Commerce, the Hon'ble Mr. Rosling and the Director of the Imperial Institute with regard to Professor Dunstan's visit to Ceylon in connection with the Rubber Research Scheme. As Professor Dunstan is not coming to Ceylon at present as was expected, representations had been made that a specialist should be sent out at once and a beginning made.

A long discussion followed in which the Chairman, Messrs. W. Coombe, R. G. Coombe, Golledge, Layard, Davies, Fraser and Campbell took part.

It was decided that a meeting of the Rubber Research Committee should be called to arrange the plan of work in Ceylon; that the research work should, if possible, include the investigation of Hevea cortex to determine the effects of tapping on the translocation of food materials; that the Rubber Growers' Association be approached with a view to amalgamation.

3. Mr. Petch stated the facts as at present known that tend to negative the idea that Hevea burrs are caused by any insect or fungus.

4. The Chairman referred to correspondence between the Director of Agriculture, the Colonial Secretary, the Government Mycologist and the Secretary of the Planters' Association as regards proclaiming Hevea Canker under the Plant Pests Ordinance. Mr. Petch described how the spread of canker is prevented.

The terms of the proposed proclamation were agreed upon.

5. The Chairman explained the correspondence that had been referred to him on the question of Shot-hole Borer in tea. Several members stated Shot Hole Borer was much more prevalent than was supposed and expressed the opinion that under the terms of the ordinance its spread could not be effectively controlled.

It was resolved that the question of amending the ordinance be discussed at the next meeting.

6. Bad Jat Tea:—Mr. Wilkins said that he is carrying out experiments and would submit results at a later meeting.

7. The Chairman said that he had invited the Manure Firms of Colombo to send representatives to the meetings if they wished and they had expressed themselves as desirous of doing so.

8. Report on Tea Experiments:—Mr. Davies said that Mr. Bamber had his records of Manurial Experiments. As the report had not been received from Mr. Bamber it was resolved to write to him to send it.

9. A discussion took place as to the beneficial results of manuring rubber, and Mr. Fraser expressed his opinion that the dominant ingredient for Hevea was nitrogen. On being asked whether nitrogen did not induce leaf growth at expense of latex he said this was not his experience.

10. Mr. Petch informed the Committee that the experiments with sterilized manures were proceeding.

11. The Chairman said that Mr. Rutherford, the new Government Entomologist to succeed Mr. Green, left England on the 8th instant and should be here at the beginning of next month.

12. The Chairman said that Messrs. Whittall & Co., on behalf of Messrs. Dunlop, had applied for some Wickham hard cure, and he had replied that he would let them have some provided Messrs. Dunlop took corresponding quantity of crepe from Peradeniya for parallel trials and send him a report for publication. He was awaiting reply. Mr. Fraser enquired whether the Wickham Machine could be used on a large scale and received a reply from the Chairman in the affirmative.

13. The Chairman referred to an enquiry made by a pressman and asked the opinion of the Committee as to advisability of admitting reporters at meetings. Messrs. Golledge, Davies, Still, Layard, Beachcroft and Coombe offered remarks.

On the suggestion of Mr. R. G. Coombe it was resolved that the Superintendent of the Experiment Station be asked to record full minutes of the meetings to be sent to the press as preferable to admitting reporters. These could be published in the *Tropical Agriculturist* and the *Planters' Gazette*.

14. Programme for planting up 20 acres newly opened land was discussed next and it was decided that half should be planted with selected trees 20 × 20 and a half 20 × 10, the holing to be done by dynamiting leaving a control plot of one acre between every 4 acres wherein holes were prepared in the ordinary way.

15. The Chairman invited proposals as to the planting up of a 3-acre plot cleared of old cacao: several crops such as Indigo, Cacao and Coconuts were suggested, but not approved. It was resolved to conduct rubber spacing experiments planting trees in pairs 4 feet apart, 30 feet dividing the pairs

16. Mr. Golledge asked whether a new labour saving holing tool, a boring screw, could be experimented with at Peradeniya and it was resolved to procure one.

17. As regards erecting tea machinery at the Experiment Station the Committee thought that it was an unnecessary expenditure, and the price obtained for leaves was considered satisfactory.

18. The Chairman announced that Messrs. Freudenberg & Co have offered manures free of cost for the proposed coconut trials. It was resolved to accept the offer with thanks.

19. The Chairman read a letter received from Mr. Edmund Grigson of Kudaganga re Acme rubber cup supports. The Committee thought that the price of Rs 30, per 1,000 was prohibitive. Trials will be made with these cup-supports at the Experiment Station.

D. S. CORLETT,

Secretary, Committee of Agricultural Experiments.

PERADENIYA, 17th March, 1913.

Sales of Produce in British and Continental Markets.

Fibres, Cotton, Grain, Oil Seeds, Hides and Skins, Timber, Rubber, Drugs, Wool, Ores, Mica, Gums, Tea, Cocoa, Coffee, Copra, Sugar, etc., are being regularly dealt in ; Keymer, Son & Co., being selling Agents for Estates, Mills and Exporters.

Samples Valued.

Best Ports for Shipments Indicated.

THE MANAGEMENT OF

ESTATES UNDERTAKEN.

Capital found for the development or purchase of valuable properties.

KEYMER, SON & Co.,

Whitefriars.
LONDON, E. C.

(Same address since 1844).

Cables :
KEYMER, LONDON.

PROGRESS REPORT
OF THE
EXPERIMENT STATION, PERADENIYA,

FROM 8th JANUARY, to 13th MARCH, 1913.

Management. Mr. D. S. Corlett took over the management of the Experiment Station on the 4th February.

Tea. The Dadaps on plot 144 were pruned and mulched for the first time on January 13th, yielding 688 lbs. of mulch.

Plot 145 was manured with the following mixture in alternate rows on 22nd February:--

300 lbs. Nitrolim
100 ,, Basic Slag
100 ,, Sulphate of Potash

The general yield continues satisfactory more especially in the dark-leaf Manipuri.

Cacao. One round of canker has been accomplished. Canker has been unusually bad owing to the wet weather in January. Cost has thus increased to Rs. 3·95 per acre. The number of trees cut out and the number of trees treated for canker, and the number of cankered pods in each plot is attached in a separate form. The crop for the year 1912 shows an increase of 189,989 good pods over last year, notwithstanding the cutting down of several acres. The grade of cured cacao was excellent, prices realized in Colombo being as follows:—

10 cwt of Extra good @ Rs. 52·50.
108 ,, ,, Good @ ,, 51·75.

Better prices could have been obtained on the spot if sold by auction. In the young cacao plots 63—67, the young pods and shoots have been removed. These plots will require supplying in June, for which seed has been sown in supply baskets.

Coconuts. Plot No. 1½ acre, was manured with 250 lbs of salt at a radius of 10 feet wide costing Rs. 3·15¾

Plot No. 8 ploughed on February 19th, costing Rs. 4·20.

Plot No. 52 of young coconuts is being ploughed.

Plot 53, the Tephrosia Candida has been cut down but was allowed to grow too old to mulch in. Supplies have been ordered from Mr. G. T. Nicholas of Goluwapokuna Estate.

From February 10th till March 10th 40 beetles have been destroyed.

Drains are being cleaned in these plots.

Hevea Rubber. All Hevea trees are wintering and are being rested from 16th February till end of March.

Plots 83—86 have been manured with the list of mixtures given last meeting. The manure was applied between every two rows in trenches 3 feet by 6 in. and forked in with leaves and buried. Cost of applying Rs. 19·60.

The biscuits are being converted into crepe and will then be ready for sale.

The nurseries have been manured with 120 lbs. basic slag and Kainit, and are looking well.

Manihot Dichotoma plots 25, 11 and 12 have been manured with 100 lbs. Nitrolim, 200 lbs. Fish, 150 lbs. Bone Dust, and 100 lbs. Sulphate of Potash. They have been generally tidied up and will be tapped later on.

The Funtumia trees were tapped in February. Six trees tapped last December only yielded an average of 13½ cc. of latex each whilst 6 trees which have never been tapped yielded an average of 37 cc. 34 trees in all were tapped yielding 878 cc. of latex, 1¾ lbs. of wet rubber and 15oz. of dry. The latex was coagulated in an hour by boiling with a small amount of acetic acid.

Seeds are being collected.

Paddy. This will be harvested next week.

Camphor. Plot 24 has been manured. 100 lbs. Nitrolim, 200 lbs. Fish, 150 lbs. Bone Dust and 100 Sulphate of Potash applied in rings 3 feet from the trees. We hope soon to have a still for this.

Fruit Plots, have been ploughed and forked and supplies will be got ready.

Coffee. The Coffee cannephora has flowered and looks well.

Sisal. As this was poling it has been cut down and fibre extracted from the leaves. The land is available for replanting.

Clearing. A start has been made on contract for the clearing of 20 acres of new land. Ten acres will be on the plateau of the Gangaroowa hill below the rock temple. The other ten will run above the cacao plots 111, 112, and 113. Three acres of old cacao plots 73—76 are also being cleared by contract.

Auction. The prices realised at the auction held on the 5th instant were very good. Coconuts realised Rs. 64·50 for good nuts as compared with Rs. 49 at the last sale.

Cattle. The herd of native cattle will be disposed of as soon as possible and new working cattle purchased, as there is much work that can be done with plough, harrow and cultivator.

Labour is not very satisfactory owing partly to small wages and partly to lack of accommodation. The wages of good coolies will be raised with circumspection and the ruined lines of 12 big rooms existing in the new clearing will be repaired, and in this way we hope to secure good labour which is so necessary, to obtain the best results of experiments.

General. 134 visitors have been conducted round since last meeting.

D. S. CORLETT,

Superintendent of Peradeniya Experiment Station.

CACAO.

Plot.	January.	February.		January.	February.	
		No. of trees treated.	No. of trees cut out.	No. of cankered pods.	No. of cankered pods.	Total number of cankered pods in January & February.
1		24	—	432	10	442
2		22	2	286	44	330
3		37	—	402	26	428
4		69	8	64	8	72
5		74	6	124	10	134
6		60	5	400	12	412
7		94	11	66	8	74
8		61	13	240	24	264
9		72	12	320	18	338
10		69	11	146	26	172
7A		32	2	66	40	106
94A		29	4	96	20	116
94B		28	5	50	28	78
95A		39	2	92	54	146
95B		48	4	40	6	46
96A		44	1	72	34	106
96B		21	3	58	6	64
98		66	5	80	16	96
99		—	—	40	5	45
100		—	—	48	4	52
101		—	—	28	3	31
107		77	9	160	80	240
108		92	16	210	80	290
109		102	17	140	14	154
110		67	14	110	6	116
111		76	18	192	16	208

PROGRESS REPORT OF EXPERIMENT STATION, MAHA-ILUPPALAMA:

From January 12th to March 12th 1913.

Coco uts. A number of vacancies have been supplied.

Weeding and loosening the soil in 6 foot rings round the trees has been begun on the unirrigable plots. This work is being pushed on as fast as possible.

As regards cultivation, ploughing which was seriously delayed owing to the late continuation of the monsoon rains, began on the 1st of February and is being continued daily. Up to the present some 25 acres of coconut land has been ploughed, and a few acres have been disc-harrowed.

Attack of red beetle appears to have been successfully checked ; only two trees being under treatment during this period.

Paddy. On each of the nine one- acre plots the crop is making satisfactory growth. All the plots are in ear and some of them will be ready to harvest in 10 days' time.

Cotton. The lower half of the 9-acre plot of American cotton behind the Superintendent's Bungalow was clean-weeded in January.

The 2-acre plot of Egyptian cotton was clean-weeded in February, and is again being weeded.

The cotton crops have not made satisfactory growth, plants being spindly or stunted in growth. This may certainly be put down to the excessive and prolonged rains in January, 12·40 inches falling whereas the average for this month is 2·33 inches.

Soya Bean. The plot sown in December is now ready for harvesting, and a very fair crop is expected.

Dichotoma Rubber. Half of the plot was clean weeded in February ; the trees are making very fair growth.

Tea and Coffee. The plots of tea and coffee have been receiving special attention ; most of the plants are alive.

Indigofera Arrecta. The drilled plot has made much better growth than the plot sown broadcast. The crops are now seeding freely and the seed is being collected.

Pine Apples. There is a good show of young fruit on each of the plots of Kew and Mauritius pines.

Plantains. Of the four varieties growing, Anamalu and Kolikuttu appear to be thriving the best. A few bunches of fruit have already appeared.

Rainfall.

January	... ...	12·40 inches
February	... ...	2·97 inches

G. HARBORD,
Superintendent, Experiment Station,
Maha-iluppalama.

STATE AID TO AGRICULTURE IN AUSTRIA.

The following notes are from the *Journal of the Board of Agriculture* for February 1913:—A fund which provides a sum of £250,000 yearly for the development of the animal breeding industry in Austria in the years 1910—18 was established by a law of December 30th, 1910. According to the report of the Austrian Ministry of Agriculture on the administration of the fund in 1911, £42,000 was allocated to the sale of live stock, while £208,000 was granted in aid of the promotion of animal breeding and to the improvement of live stock. This latter sum was distributed among the various provinces of the empire in proportion to the number of cattle in each as determined by a census taken on December 31st, 1900. The whole of the £250,000 was not spent in either 1910 or 1911. The total amount unspent, including interest, reached the sum of £170,000 at the end of 1911.

IMPROVEMENT OF LIVE STOCK.

Of the total sum provided annually for the animal breeding industry, £83,000 was allocated in 1911 to animal breeding proper, of which, however, only about £57,000 was actually spent. First class bulls and good cows were purchased, subventions were granted to cattle breeding centres, efforts were made to establish herd books, and premiums were granted to stockmen whose animals were well fed and cared for. With a view to saving calves from the butcher, provision was made from the fund in respect of premiums for calves and the formation of breeding centres for calves in those districts of the empire, where such a course was considered necessary. Included in this part of the scheme is the encouragement of the growth of fodder crops.

IMPROVEMENT OF PASTURE.

An important part of the scheme is the improvement of poor pasture. The sum of approximately £46,000 was allocated to this purpose in 1911 (£23,000 being the amount actually spent), principally in the Alpine and Carpathian districts. In the three provinces of Upper Austria Salzburg and Karnten, provision was made for the improvement of moor and heath land, a further sum of £1,300 being granted for this purpose (£400 being actually spent).

DAIRYING.

The sum of £15,000 granted to the dairy industry in 1911 (the amount actually spent was £9,000) was devoted to the provision of dairy experts to advise as to the maintenance of dairy herds, the production and handling of milk, and the manufacture of dairy produce; the holding of dairying courses; arrangements for the visits of agriculturists to dairy schools and model dairies; and the publication of dairying journals. In some cases also assistance was given to co-operative associations of dairy farmers.

PURCHASE OF FERTILISERS AND FEEDING STUFFS.

Co-operative associations having as their object the purchase of fertilisers and feeding stuffs were subsidised to the extent of £5,300 in 1911.

LIVE STOCK INSURANCE.

The sum of £25,000 was spent in 1911 in the promotion of animal insurance among agriculturists. The procedure has been to subsidise agricultural insurance institutions formed by the diets of several of the Austrian provinces, which have as their object the division of the country into insurance districts, and which aim at making each of the local societies self-dependent. The problem of the organisation of live stock insurance appears to have been most happily solved in the Tyrol, where the independent local societies are themselves insured with an agricultural reinsuring institution. As a result of poor harvests of fodder crops, the prevalence of animal disease, and the lack of any substantial reserve funds, the institutions have had great difficulty in carrying on their work. The Ministry of Agriculture have, therefore, granted £4,000 a year for five years to the institutions in Lower Austria, and have so far given £1,300 a year to the institutions in Upper Austria, £2,000 to those in Mahren, £2,000 to the institution in Tyrol, £600 to that in Karnten, and £130 to that in Istria. These sums have been granted, however, only on the understanding that they are to be applied to the insurance of cattle. In those provinces in which the organisation of the arrangements for insurance have not been completed various sums are laid by yearly from which the institutions will be aided when they are in working order ; as much as £6,000 a year is being laid by for this purpose for the province of Galicia. Two provinces have resolved not to found these central institutions, and the Ministry of Agriculture have therefore been compelled to aid the local societies directly.

SALE OF LIVE STOCK.

An account of the organisation of the sale of live stock in Austria was given in this Journal for November, 1912, p. 691.

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xx 533

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GINGER.

(Illustrated. See frontispiece.)

Ginger is one of the most important of the spice plants, and appears to be among the earliest tropical spices known to Europeans. It was familiar to the Greeks and Romans, and is recorded to have been known in England before the Norman conquest. It is said to be the first Oriental spice introduced into the New World, the Spanish having brought it to Mexico shortly after the discovery of America. The fleshy rhizomes being of long vitality, the transport of the plant over long distances presented no difficulty, so that it has long been established in all warm countries. The plant is considered to be a native of parts of tropical Asia, but being nowhere found in a wild state, its original home is not definitely known. It is not apparently indigenous to Ceylon, though it is shown to have been grown here before the Dutch conquest.

The plant is a herbaceous perennial, with leafy shoots which grow to a height of about 18 or more inches. It belongs to the Natural Order *Scitamineæ* and is known botanically as *Zingiber officinale.* The Sinhalese name is "Inguru," the Tamil "Inji," the Hindu "Sonth" and the Malay "Haliya." The tuberous underground stems (rhizomes) resembling thickened roots, are the ginger of commerce. These are called "hands" or "races," from their palmate shape, and are exported in two forms, *peeled* and *unpeeled* (or uncoated and coated) ginger. The former is prepared by scalding the tubers in boiling water, the epidermis being then removed scraping with a narrow-bladed knife. Unpeeled or coated ginger, *i.e.* not deprived of the epidermis, is merely washed and afterwards dried in the sun. The rhizomes are exported in bags or barrels, and sold in London at prices varying from 40 to 70 shillings per cwt. according to quality. About the year 1840 ginger fetched, it is recorded, as much as 180 shillings per cwt. in London. Jamaica ginger invariably commands the highest price, Calicut or Cochin ginger usually coming second. Chinese ginger fetches a lower price than these, and is mostly used in preserves.

The ginger plant is adapted to a comparatively wide range of climate but thrives best in a moist and hot district with rich loamy, well-tilled soil. In Ceylon it thrives up to about 3,500 feet elevation, but is seldom cultivated, except in coolies' gardens. The plant requires light shade, and is benefited by frequent stirring of the soil between the rows; in dry weather the ground should be covered with a mulch of leaves or leaf-mould. Manuring is essential, especially in poor soil or where the plant is cultivated for more than one season in the same ground, and farm-yard or natural manure is usually preferred.

The plant does not produce seed, but is readily propagated by division of the tubers or rhizomes. "Sets" or pieces of these should be planted in rows two feet apart, with about fifteen inches between the plants in the rows. A crop is yielded in about ten months from the time of planting, the proper time of harvesting being indicated by the leaves turning yellow and then withering. The yield varies to some extent with the nature of the soil, as well as with the amount of care taken in the cultivation of the crop. Under very favourable circumstances a return of 2,000 or even 2,500 lbs. per acre may be obtained, but 1,250 lbs. per acre is a good average yield.

Besides its use as a flavouring ingredient, ginger is highly valued in medicine, more especially in England. It is esteemed in Ceylon and the Eastern tropics generally as a stomachic and internal stimulant, particularly in flatulency and colic. Fresh rhizomes pounded and the juice drunk is a common native remedy for colic and dyspepsia. It is also used to relieve toothache by chewing it, and sometimes used externally in the form of ginger-plaster as a rubefacient for headache. An oil is extracted from the rhizome, from which tinctures and essences of ginger are prepared. It is to this oil that the characteristic odour of ginger is due, the pungent taste being due to the resin present. The active principle of ginger *(gingerole)* is described as a viscid fluid of the consistency of treacle, of a cream colour, devoid of odour and with an extremely pungent taste.

H. F. MACMILLAN.

A NEW VARIETY OF MAIZE.

By C. M. CONNER,

CHIEF OF DIVISION OF AGRONOMY.

A new variety of maize which is a cross between Mexican June and a native white maize was exhibited at the last Carnival by the Moro Province. For want of a better name it is called "Moro." The ears average about 19 centimeters long and 5 centimeters thick at the centre and have sixteen rows of grains. Two hundred and thirty ears fill a cavan * measure while it requires about four hundred and eighty ears of the average Laguna maize to shell one cavan. The majority of the ears are inclined to be cone-shaped but this can be corrected by selection. The buts and tips are well filled out. The grains are white, hard and flinty except for the tips, which have some soft starch. They average 8 millimeters wide by 9 millimeters long. The germ is quite large as compared with the size of the grain.

This variety of maize makes good meal and hominy and should prove quite popular in the demonstration work.

Some preliminary tests have been made and the average yield is found to be much better than the small native varieties.

A large quantity of this maize has been purchased by the Bureau and will be distributed free throughout the Islands.—*Philippine Agricultural Review.*

A NEW VARIETY OF CUCUMBER.

A few years ago there was introduced into Queensland a variety of cucumber, which had more the appearance of a small round rock melon than of the usual long type of cucumber. For some reason or other, it went out of the market, and only lately has been revived by Mr. E. C. Holland, of Redbank Plains, who obtained the seed from Messrs. Chas. Taylor and Co., Brisbane, under the name of "German Apple Cluster" Cucumber. Mr Holland has been very successful in the cultivation of this variety, and has also induced many to try it, with the result that it has become a general favourite in the Goodna and Ipswich district, where the fruit sells readily at 6d. per dozen retail. It is a most prolific bearer, every joint of the vine producing from 3 to 5 fruits, in many cases double fruits, as may be often seen in the case of bananas. It was known in times past as the "Chinese Apple" Cucumber, which bore no affinity to the corrugated, hard Japanese variety. It may easily be mistaken for a small smooth rock melon. One great point in its favour is, that the pumpkin beetle will scarcely trouble the vines. Mr Holland has destroyed hundreds of beetles on other varieties of cucumbers, melons, etc., but scarcely any have attacked the apple cucumbers.—*The Queensland Agricultural Journal.*

* One cavan equals 75 iters.

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INDEX TO THE APRIL NUMBER.

PAGE.

A New Milking Machine, - 166
A New Timber Plantation and Mining Enterprise in India - - 183
Agricultural Bank of Egypt, The - object of - - 154
Agricultural Co-operative Credit Societies and Joint Stock Banks, 158
Agricultural Education, Progress in 192
Agriculture, College of Tropical 137
Agriculture in Austria, State aid to 205
American Cotton, The Future of - 170
Areas under cultivation in Ceylon in 1912 - - - 187
Artificial Incubation, Experimental work in - - - 150
Australia, Farm Competitions in 191
Austria, State Aid to Agriculture in 205
Bacteriological Content of Milk, Some factors affecting the - - 167
Beans, Phaseolus Lunatus - 194
British Board of Agriculture, New Order of the - 193
Cacao Canker - - - 178
" Fermentation of - 176
" Spraying - - 176
Ceylon Coconut Industry - 187
" Planting Industries in 1912 186
Chicken Rearing on an Intensive System 152
Clean Milk, Production of, on two large dairy farms - - 164
Coagulation of Funtumia Latex at Peradeniya - - 148
Coconut Industry, Ceylon - 187
College of Tropical Agriculture - 137
do do Report of Committee - - 139
Commercial Possibilities of Synthetic Rubber - - 144
Committee of Agricultural Experiments 197
Co-operative Credit - - 161
do do do India 159
Cotton and subsoil water - - 172
Cotton Belt of America, Intensive Farming in the - - - 196
Cotton, The World's Supply, - 170
do The Future of American 170
do Trade in 1912 - 171
Cultivation in 1912, Areas in Ceylon under - - - 187
Dr. Willis on Rio Climate - 194
Education, Progress in Agricultural 192
Egypt, The Object and Work of the Agricultural Bank of - 154
Experimental Work in Artificial Incubation - - - 150

PAGE.

Extracting Sisal Fibre - 174
Farm Competitions in Australia 191
Fermentation of Cacao - 176
Fine Hard Cure Rubber - 147
Funtumia Latex, Coagulation of at Peradeniya - - 148
Future of American Cotton - 170
Hemp (*Illustrated*) - - 175
Indigo in Madras - - 185
Intensive Farming in the Cotton Belt of America, - - 196
Kew, Visitors to - - 196
Machine, A New Milking - 166
Madras, Indigo in - - 185
Mauritius Hemp - - 175
Milk Some factors affecting the Bacteriological Content of - 167
Milking Machine, A New - 166
Peradeniya, Record Temperature at 197
Planting Industries in 1912 - 186
Planting Gazette, The - - 169
Production of clean milk on two large dairy farms, - - 164
Progres in Agricultural Education.
Progress Report of the Experiment Station, Peradeniya, from 8-1-13 to 13-3-13, - - - 201
Progress Report of Experiment Station, Maha-iluppalama, from 12-1-13 to 12-3-13.- - - 204
Record Temperature at Peradeniya 197
Report of Committee, College of Tropical Agriculture. - 139
Rio Climate, Dr. Willis on - 194
Rubber, Commercial Possibilities of Synthetic - - - 144
do Fine Hard Cure - 147
Sisal Fibre, Extracting - - 174
Some factors affecting the bacteriological content of milk - - 167
Spraying Cacao - - - 176
State Aid to agriculture in Austria 205
Synthetic Rubber Commercial Possibilities of - - - 144
Temperature at Peradeniya Record 197
Timber plantation and mining enterprise in India, A new - - 183
The *Planting Gazette* - - 169
The Object and Work of the Agricultural Bank of Egypt, - - 154
The World's Tobacco Crop - 149
Tobacco Crop of The World - 149
Tropical Agriculture - College of 137
Vegetable Oils - - - 169

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CONTENTS.

	Page.
Hedychium Coronarium - -	209
Flue Curing of Tobacco -	213
Curing Cigar Leaf - -	214
Cocoa—Its Cultivation and preparation	219
Cultivation of Cacao in Tobago and Trinidad - -	221
Cacao husk as food for milch cows	223
Preparation of Hard Cure Para by hand moulding - -	224
Ceylon Exhibits at the International Rubber Exposition of 1912 -	224
Dispersal of the Ceylon Exhibits -	225
Tea - - -	226
A Visit to Washington - -	227
Inquiries and conclusions -	227
The Rubber District of the Amazon	231
Rubber in the Orient and on the Amazon - - -	234
Poultry Laying Competition -	240
Poultry Experiments in America -	240
College of Tropical Agriculture for Ceylon - -	242
Agricultural Education in Java -	245
Farm Schools in France, Germany and Belgium - -	248
A British University of Tropical Agriculture - -	250
The Relative Strength of Natural and Plantation Grown Teak -	252
Preventing Timber from Splitting while seasoning - -	253
Shrinkage of Timber - -	253
The Practical Use of Timbers -	254
Cotton Growing in the Anglo-Egyptian Sudan - -	256
Cotton Growing in Louisiana -	257
Black Cotton Soils - -	261
Cotton Aphis - -	262
Cotton in Egypt - -	263
Progress Report LXII of The C.A.S.	267
Some Problems connected with Village Cultivation in Ceylon	281
A few Rough Notes at Peradeniya	285
The German Emperor as an Agriculturist - - -	287
Vegetable Ivory - - -	287
The Colombo Fumigatorium -	287

HEDYCHIUM CORONARIUM IN BRAZIL.